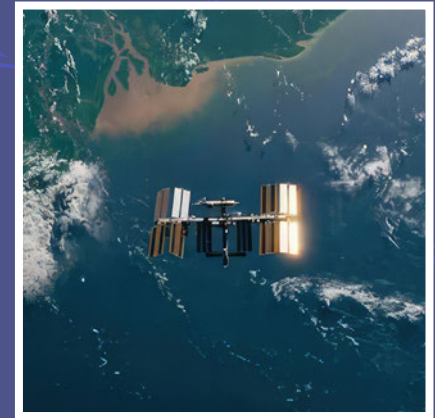
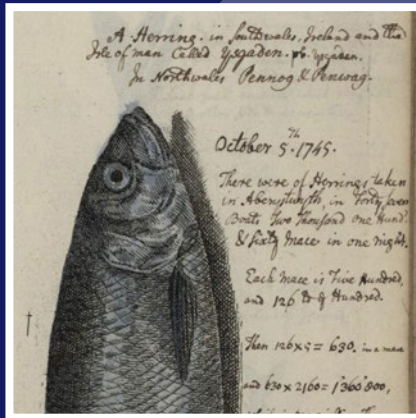




UK Research
and Innovation

UKRI incentivising and removing barriers to interdisciplinary research

Awarded projects from round 1 of the Cross research council responsive mode pilot scheme (CRCRM)





Arts and
Humanities
Research Council



Biotechnology and
Biological Sciences
Research Council



Engineering and
Physical Sciences
Research Council



Economic
and Social
Research Council



Medical
Research
Council



Natural
Environment
Research Council



Science and
Technology
Facilities Council



Scan here for the
CRCRM webpage

About the CRCRM scheme

The cross-research council responsive mode (CRCRM) pilot scheme supports emerging ideas from the research community that transcend, combine, or significantly span disciplines, to ensure all forms of interdisciplinary research have a home within UKRI. £65 million will be awarded through the pilot scheme across two rounds.

The CRCRM is a new pilot scheme designed to stimulate exciting new interdisciplinary research by:

- unlocking new research, approaches and methods that would not be possible from established disciplinary thinking
- encouraging new and unexpected types of interdisciplinary research not currently funded through existing UKRI responsive mode schemes
- supporting research that will be potentially transformative for the participating disciplines or lead to the creation of new disciplines.

An Interdisciplinary Assessment College (IAC), comprising members with experience of working in or supporting interdisciplinary research, has been appointed and specifically trained for the assessment of applications to the scheme.

Through this novel assessment process, we anticipate that we will identify and support new interdisciplinary research projects that, through current UKRI routes, may struggle to secure support.

Foreword



Professor Alison Park

UKRI CRCRM Champion

Deputy Executive Chair of the Economic
and Social Research Council (ESRC)

The perspectives of different disciplines, working together in collaboration, are vital to solving some of the most pressing problems we face as a society. The UKRI cross research council responsive mode pilot scheme (CRCRM) is designed to break down silos and champion research that transcends, combines and significantly spans traditional discipline boundaries. It adds a new source of support to the many ways in which UKRI already funds interdisciplinary research.

This booklet summarises the 36 projects funded through round 1 of the CRCRM pilot scheme. Each is conducting research based on exceptional interdisciplinary practice, creating fresh approaches to their research questions, methodologies and ways of working, and driving progress across a wide array of fields. UKRI and our appointed Interdisciplinary Assessment College were genuinely excited to see the innovative and bold approaches being adopted, and the breadth of issues being tackled - from climate change to global healthcare. We look forward to following their progress.

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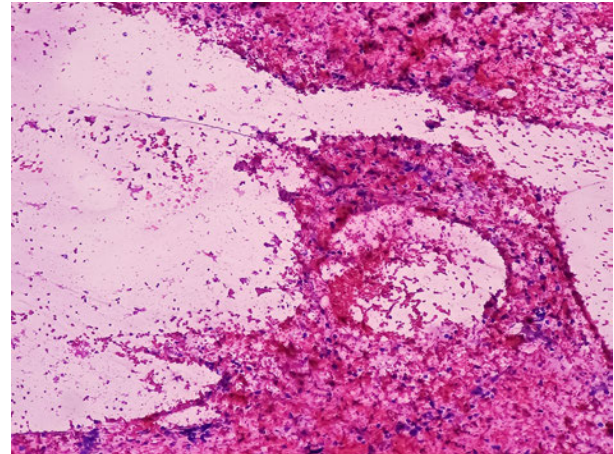
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Combining a snake-like robot with wireless electrical-molecular signalling to tackle cholangiocarcinoma (CCA)

Bile duct cancer (cholangiocarcinoma) affects 3000 people in the UK each year, with only 13% of patients surviving 3 years. The project brings together experts in medicine, endoscopy, engineering, robotics, physics, imaging, bioelectrics and genomics to improve the accurate diagnosis and treatment of bile duct cancer.

The project will develop an ultra-slender snake-like robot technology that will be used to navigate the narrow bile duct and capture images to inform the design of a 3D map. Stents, loaded with nanoparticles, will be delivered into the bile duct and activated using wireless electrical fields to stimulate the death of cancer cells.

The combined approach will create the capability to deliver treatment with greater precision with the expectation it will lead to the improved survival and quality of life for patients with CCA.



Project Lead and Co-Leads:

Guruprasad Aithal, Abdelkhalick Mohammad, Abhik Mukherjee, Alan Mcintyre, Anna Grabowska, Dragos Axinte, Frankie Rawson, George Gordon, Ioan Notingher, Jane Grove, Kenton Arkill, Kevin Gaston, Padma-Sheela Jayaraman, Xin Don – *University of Nottingham*
Arvind Arora, Dhanny Gomez, Martin James, Philip Kaye, and Suresh Venkatachalapathy – *Nottingham University Hospitals NHS Trust*

Realtime wireless monitoring of inflammation for improved healthcare outcomes

Implanted medical devices often fail due to adverse inflammatory responses. This can severely impact a patient's health and require costly revisions, extended hospital stays and increase mortality rates.

This interdisciplinary collaboration will address the challenge of implant failure by monitoring the changes in the body's response to implanted devices in real-time with a non-invasive device.

The wireless sensing approach will enable monitoring of inflammatory responses to implants in any clinic or research lab, without the need for advanced imaging equipment and will aid the development of new implant designs.



Project Lead and Co-Leads:

Morgan Alexander, Amir Ghaemmaghami, Emma Wilmot, Frankie Rawson and Jeni Lucket – *University of Nottingham*.

Project Partner Organisations:

MIT Koch Institute, Rice University, Medtronic



Looking Inside Living Algal Cell Wall – A Soft Matter Approach

Marine organisms, such as algae, are remarkably versatile; they have adapted themselves to virtually every ocean and freshwater ecosystem on the planet over 1.5 billion years of evolution.

This complexity and adaptivity underlines the fascinating material properties of the marine cell wall, which remains poorly understood. This project seeks to explore, explain, and exploit the diversity of marine cell walls by combining tools, materials and perspectives from bioscience, physics and the chemical sciences.

This knowledge is essential for predicting how marine organisms will adapt to climate change and will aid in the development of novel adaptive biomaterials that are derived from natural feedstocks.



Project Lead and Co-Leads:

Anders Aufderhorst-Roberts – *University of Liverpool*

John Girkin, John Bothwel – *Durham University*

Marina Kuimova and Anna Barnard – *Imperial college London*



IMPERIAL

A novel, real-time tuberculosis detector for animals and humans

Tuberculosis (TB), is a major cause of suffering and death in humans worldwide. Bovine Tuberculosis (bTB) is a particular problem for farmers in Wales who have seen bovine TB decimate herds across the country.

The bacteria that cause TB and bTB are very closely related. Diagnosis of infection is challenging due to the lack of rapid, accurate testing. To address this issue researchers in veterinary medicine, microbiology, microwave and photonic engineering will advance the development of a real time diagnostic assay capable of detecting the presence of the bacteria in clinical and environmental samples.

The technology will be simple enough to be operated by any healthcare worker or farmer and further development to reduce the size and cost will have particular benefit for use in developing countries. In the future it could easily be adapted to detect most other pathogens, becoming an important tool to help control the spread of future pandemics.



Project Lead and Co-Leads:

Les Baillie, Jonnathan Lees, Heungjae Choi – *Cardiff University*
Glyn Hewinson, Amanda Gibson, Nigel Copner – *Aberystwyth University*



Advanced interdisciplinary models of destructive lung disease

Destructive lung diseases are the third largest cause of death worldwide and Chronic Obstructive Pulmonary Disease alone costs the NHS £1.9bn each year. The diseases are characterised by destruction of the tissue that make up the air sacs within the lung, and progressive loss of lung function.

The mechanisms by which injury, abnormal repair processes and tissue mechanics interact to cause this destruction are not well understood. This gap in understanding delays diagnosis, timely treatment, and personalised care.

This project will develop novel combinations of biological and imaging data with mathematical and computational models to help establish the relationship between the lung tissue loss and the injury - repair processes at the genetic and cellular levels.

These tools will help us better understand the underlying mechanisms and determine new sensitive biomarkers to detect active disease, enabling early interventions to prevent lung damage and death, and ultimately facilitating the rapid evaluation of new treatments.



Project Lead and Co-Leads:

Bindi S Brook, Simon R Johnson, Ian Sayers, Reuben O'Dea – *University of Nottingham*

Gowsihan Poologosundarampillai – *University of Birmingham*

Himanshu Kaul – *University of Leicester*

Project Partner Organisations:

University College London (HOAHub),

University of Manchester (BIOREME), Diamond Light Source



Microbes that listen: Using ultrasonic bubbles to help microbes destroy persistent organic pollutants

Engineers, microbiologists, physicists and chemists will work together on new ways to get rid of some of the most recalcitrant pollutants in our biosphere; per- and poly-fluorinated alkyl substances (PFAS).

A new hybrid technology combining ultrasonic bubbles (sono) and microorganisms (bio) will be researched. The new technology will use the bubbles to help microbes break down large pollutant molecules while at the same time, use the bubble collapse to destroy small pollutant molecules. New analytical methods will be researched to understand the combined sono-bio system.



Project Lead and Co-Leads:

Madeleine Bussemaker, Claudio Avignone Rossa, Patrick Sears and Melanie Bailey – *University of Surrey*

Project Partner Organisations:

Technical University of Denmark, Cornelsen, Waters Corporation and Romil



Imaging live Antarctic cells at sub-zero temperatures using high resolution microscopy

The project will develop the first high resolution microscope systems to study the real-time behaviour of proteins in Antarctic fish cells at sub-zero temperatures. The research goal is at the very intersection of biology, physics, engineering and chemistry, and will transform our understanding of evolutionary adaptation to life in the cold and how it will be affected by climate warming.

This project has further applications in medicine, such as long-term storage of therapeutic proteins and cryopreservation, and innovative applications in developing low temperature enzymes for societal benefit. The project will also lead to the advancement of imaging technologies for use in hazardous conditions such as high-level biological containment laboratories.



Project Lead and Co-Leads:

Melody Clark, Lloyd Peck – *British Antarctic Survey*
Clemens Kaminski – *University of Cambridge*



Ecological Knowledge Games: Bridging social-ecological models, decision-making data, and videogames

This novel interdisciplinary research programme will integrate the rich, complex and immersive environments of online video games with real world ecological and social models.

The new modelling software will enable researchers to conduct *in silico* experiments to understand and find solutions for wicked problems.

Through the games, the project will engage with, and give a voice to, under-represented communities and will give researchers and policy-makers access to a new range of information and tools for delivering on urgent United Nations Sustainable Development Goals.



Project Lead and Co-Leads:

Brad Duthie, Nils Bunnefeld, Conor McKeown – *University of Stirling*
 Diana Valero, Jianyu Chen – *James Hutton Institute*
 Yuan Pan – *King's College London*

Project Partner Organisations:

Marist College

UNIVERSITY of
STIRLING



The James
Hutton
Institute



MARIST

Protocol development and feasibility study for the elevated childhood lead interagency prevalence study

Lead pollution is a global problem and toxic even in small amounts. It is common in our environment due to past use in paint, petrol and plumbing, contaminating our air, water, soil, dust and food. Children are more at risk from the effects of lead because of their growing and developing brains. Lead exposure is preventable.

This project will develop and trial a new child screening procedure to make home blood sample collection for lead testing easy, quick and stress-free. Widespread monitoring of the amount of lead in blood will help to develop policies that reduce children’s contact with lead in the community and at home.

The resulting new interdisciplinary method re-frames biomonitoring as a community-science activity: families are an integral part of the data collection, in their own home, and are supported to identify approaches to reduce lead exposure.



Project Lead and Co-Leads:

- Jane Entwistle, Lindsay Bramwell – Northumbria University,
- Frank DiTraglia – University of Oxford
- Ludovica Gazze – University of Warwick
- Carys Lippiatt – Leeds Teaching Hospitals NHS Trust
- Priya Mondal, Ovnair Sepai – UK Health Security Agency
- Jackie Morton – Health and Safety Executive
- Caroline Taylor – University of Bristol

Project Partner Organisations:

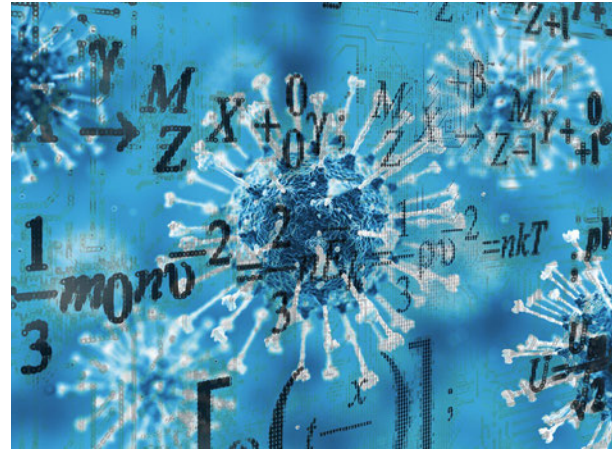
LEAPP Alliance, Synnovis

Mathematical modelling of epidemics

Epidemic infectious disease models are an essential piece of pandemic preparedness. Mathematical modelling of infectious diseases is used to guide high-impact decision-making about epidemic response at speed and the consequences of these decisions are felt unequally across society. However, there is a lack of guidance to integrate public voices into the design and analytical directions of epidemiological models.

In this project researchers, practitioners and the public will work together, sharing power and responsibility as equal partners in research.

Through integrating understanding across epidemiology, maths, social sciences, human centred design and linguistics we will iteratively develop approaches, guidance and tools to enable co-production of epidemic modelling that are inclusive and can deliver positive change across diverse groups in society.



Project Lead and Co-Leads:

Elizabeth Fearon, Niccola Pascal-Hutchinson, Beth Malory, Emily Nicholls, Shema Tariq – *University College London*
Thomas House, Caroline Jay – *University of Manchester*

Project Partners:

UK Health Security Agency, JUNIPER Partnership



FUSION FOREST: a holistic approach for the design of disease-suppressing treescapes

The UK government has set a target to increase the woodland cover to 12% by 2060 but with an alarming increase in tree epidemics the future of our woodlands is at risk.

The Fusion Forest project will provide strategies and tools to enhance the natural immunity of forests and halt tree epidemics. It will combine knowledge on tree immunity with ecology and physics and by proposing combinations of tree species and priming of defence we will increase forest resilience. We will create a tool, ForestFlow, that brings together ecological and physical modelling to predict the spread of fungal spores and design physical barriers to it.

Fusion Forest will prevent high disease pressures and enhance tree immunity ahead of the occurrence of outbreaks. The decisions we make today will determine the forest landscapes of future generations.



Project Lead and Co-Leads:

Bruño Fraga, Estrella Luna, Juliano Sarmiento Cabral
– *University of Birmingham*

Project Partner Organisations:

ANSYS, Future Trees Trust, Norbury Park Estate, DEFRA

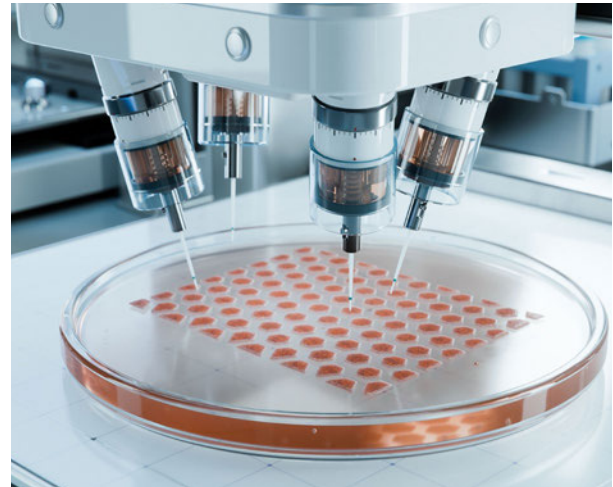


Three-dimensional spatial patterning of tissue development dynamics using light-addressable small molecule morphogens

Tissue engineering holds great promise for revolutionising healthcare, in particular to enable therapeutic approaches to repair or regenerate tissues and organs. However, realising its huge potential will need new and disruptive methods.

The pattern and shape of developing tissue is governed by the dynamic regulation and distribution of soluble biological ligands called morphogens. Replicating this to recreate the three-dimensional complexity of human tissues for engineering purposes presents a significant and unsolved challenge.

Using a team with expertise spanning physics, engineering, chemistry, biochemistry, molecular, developmental and stem cell biology, this project aims to develop light-sensitive and biologically-active morphogens to enable precise spatiotemporal control of complex tissue development.



Project Lead and Co-Leads:

Matthew Fuchter, Davia Prischich – *University of Oxford*

Serge Mostowy – *London School of Hygiene and Tropical Medicine*

James Briscoe – *Francis Crick Institute*

Christopher Rowlands – *Imperial College London*



IMPERIAL

Contact tracing, infection and transmission

The COVID-19 pandemic underlined the continuing threat from emerging zoonotic diseases. Contact tracing is important in the control of such diseases but the notion of “contact” is often poorly understood and there is limited information on the wide variety of interactions that may occur between individuals, particularly in lower-income settings where epidemic/pandemic threats most frequently emerge.

Studying interpersonal contact requires using a truly interdisciplinary perspective which fully embraces past history and local cultural traditions of interaction. It needs understandings of disease risk, communication patterns between the general population and places of potential infection/transmission, biological characteristics associated with different viruses, and an appreciation of how this information may be combined to model and modify contact patterns to limit infection and spread.

The project will provide important evidence on which to build novel policies and adaptations with the potential to enhance and disrupt our current understanding of pathogen transmission, with the ultimate goal of mitigating the impact of infectious diseases around the world.



Project Lead and Co-Leads:

Robin Goodwin, Elise Smith, Anna Six, Nicole Robb – *Warwick University*
Michael Head, Markus Brede, Winfred Dotse-Gborgbortsi – *University of Southampton*
Robin Thompson – *University of Oxford*
Wirichida Pan-Ngum – *University of Oxford and Mahidol Hospital (Thailand)*
Arunya Tuicomepee, Juthatip Wiwattanapantuwong, Dangkamon Napombejra – *Chulalongkorn University (Thailand)*
John Odoom, University of Ghana and Eliasu Mumuni – *University of Development Studies (Ghana)*



Biochar as a sustainable building material

Biochar is a charcoal-like substance, produced from organic waste biomass. It is carbon-rich and chemically-stable and therefore offers enormous potential to combat climate change.

This project aims to provide an evidence base for adopting biochar within building projects, providing awareness and reassurance of the technology to the building industry and the wider public about its use.

The interdisciplinary approach brings together civil engineering, building modelling and social science to develop a techno-economic roadmap, with input from multiple stakeholders, that will match the best biochar applications to specific building models. The project will highlight the potential carbon and energy savings and affordability for different building types.

Increasing the use of biochar in the buildings industry will contribute significantly to CO2 reductions, helping the government meet net zero emissions targets.



Project Lead and Co-Leads:

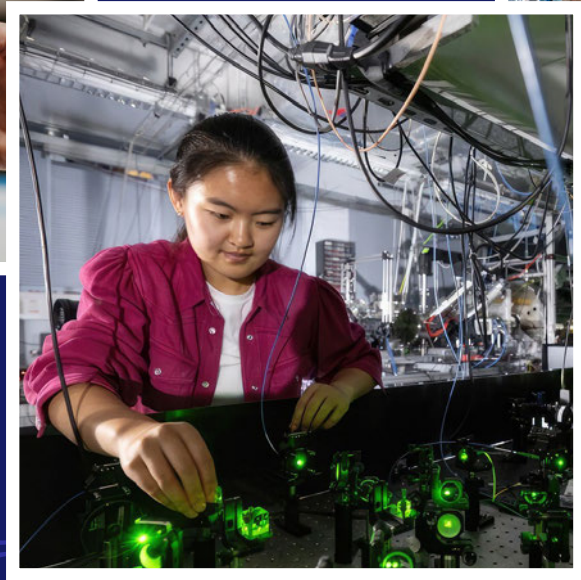
Mehreen Gul, David Jenkins – *Heriot-Watt University, Edinburgh*
 Dulini Fernando – *Aston University Birmingham*
 Moura Mehravar – *University of Birmingham*

Project Partner Organisations:

Built Environment Smarter Transformation (BE-ST), ecoLocked, Chartered Institution of Building Services Engineers (CIBSE), Enchar, Scottish Forestry, Carbonfuture, Stirling Developments, Energy Technology Partnership (ETP)







Using living artworks and citizen science to drive evidence-based pollinator conservation

Pollinators globally are in precipitous decline, despite providing critical ecosystem services.

Pollinator Pathmaker is an award-winning living artwork by Alexandra Daisy Ginsberg that addresses the pollinator crisis by algorithmically generating planting designs optimised for pollinator diversity, rather than using human garden design principles.

The project will use *Pollinator Pathmaker* as a model system to explore how living artworks can conserve pollinator diversity in limited and fragmented urban green spaces and how these artworks empower publics to engage in nature-positive actions.



Project Lead and Co-Leads:

Chris Kaiser-Bunbury, John Dupré – University of Exeter
Jane Calvert – University of Edinburgh

Project Partner Organisations:

Alexandra Daisy Ginsberg Ltd



POLLINATOR
PATHMAKER

ALEXANDRA
DAISY
GINSBERG

ESCAPE: Engaging science and the creative arts to prepare for eruptions

Understanding the behaviour of volcanoes is hampered because we cannot see directly what is happening underground. As a result, expert opinions during a crisis are often contradictory.

The ESCAPE project aims to apply techniques from participatory theatre to resolve the contradictions, using the restless Campi Flegrei volcano, near Naples in Italy, as a case study.

The results will have real-world application to forecasting eruptions; they will deliver a template for embedding interdisciplinary thinking into evaluating incomplete information and, by combining artistic and scientific creativity, they will forge new understandings of the world around us.



Project Lead and Co-Leads:

Christopher Kilburn – *University College London*

Niamh Dowling – *RADA*

Amy Donovan – *University of Cambridge*

Carmen Solana – *University of Portsmouth*.

Project Partner Organisations:

INGV-Osservatorio Vesuviano, University of Naples, Archè Teatro.



RADA



UNIVERSITY OF
CAMBRIDGE



Holistic optical biomarkers to transform dementia diagnosis

The project will investigate a new laser-based test that could revolutionise dementia diagnostics.

The novel laser-based technology will generate a 'biochemical fingerprint' from a single drop of blood or saliva. It will give an accurate diagnosis and distinguish between different types of dementia potentially years before symptoms become apparent.

The test will help identify patients eligible for drug treatments at the point when they will be the most effective. The test offers a fast, scalable and cost-effective solution to a challenge affecting millions worldwide and could transform the landscape of dementia diagnostics.



Project Lead and Co-Leads:

Christopher Kipps – *University Hospital Southampton NHS Foundation Trust*
Sumeet Mahajan – *University of Southampton*

Project Partner Organisations:

University College London, Indiana University, University of Cambridge,
Wasatch Photonics, University of Gothenburg, University of Girona

HIDDEN SAND: Holistic investigation of the distribution, extraction, and networks associated with sand

The contemporary world is built on sand and it is now the second most consumed natural resource after water. The complexity of sand as a commodity means that there is no end-to-end oversight of the supply chain and the lack of oversight and control has fuelled exploitation and criminal activity.

The HIDDEN SAND project will bring together an interdisciplinary team to develop a novel Digital Twin framework that will capture all the relevant physical, social, economic, cultural and emotional components of the sand system. High-tech survey and remote sensing approaches, socio-economic and ethnographic surveys and practice based art will deliver a whole-system understanding of the costs, benefits and trade-offs involved with the extraction and trade of sand.

HIDDEN SAND will give a voice to local populations whose environments, livelihoods, cultural practices, and overall well-being have been impacted by the sand trade.



Project Lead and Co-Leads:

Julian Leyland, Stephen Darby – *University of Southampton*
 Laurie Parsons, William Jamieson – *Royal Holloway, University of London*
 Alexandra Antonopoulou – *University of the Arts London*

Project Partner Organisations:

United Nations Environment Program, WWF-Asia Pacific,
 Jeronimo Art Curation Cambodia, British Embassy Phnom Penh



Developing a skeletal muscle model of glucose metabolism on responsive elastomer nanofibers

People with diabetes are unable to regulate their blood sugar levels, which are normally controlled by the hormone insulin. This can result in serious medical complications, including blindness and strokes. The main site of glucose uptake in the human body is skeletal muscle, however, over time skeletal muscle no longer responds to insulin rendering the therapy ineffective.

Due to the mechanical instability of cultured muscle fibers there is not a satisfactory model for the glucose uptake process. This project will develop a 3D-coculture system, combining human stem cell-derived muscle fibers and nerve cells, to investigate insulin responses in muscle. A scaffold of aligned elastic nanofibers will guide and stabilise the growth of the muscle fibers. The 3D muscle tissue model will allow genetic probes and electrochemical sensors to measure insulin responses.

Understanding the underlying mechanisms that prevent glucose uptake will lead to the development of pharmacological and genetic treatments for type 2 diabetes.



Project Lead and Co-Leads:

Ivo Lieberam – *King's College London*

Daniel Fazakerley – *University of Cambridge*

Wenhui Song – *University College London*



BeefTwin: AI powered digital twin for sustainable beef farming to transform the beef value chain

The *BeefTwin* project will revolutionize the entire UK beef farming ecosystem by introducing an AI-powered Digital Twin that models not just individual cattle but the entire farming system.

The technology will provide real-time insights into methane emissions, feed efficiency, and farming practices, enabling holistic, data-driven decision-making. The impact will be far-reaching—reducing greenhouse gas emissions, improving beef quality, boosting farm profitability, and enhancing animal welfare.

By transforming the farming ecosystem, *BeefTwin* will promote sustainable practices that will strengthen the socio-economic and environmental resilience of UK beef farming.



Project Lead and Co-Leads:

Xiao Ma, Fatima Gillania – *Nottingham Trent University*
 Rebecca Fisher – *Royal Holloway, University of London*
 Louise Manning – *Lincoln University*
 Ellen Nisbet – *University of Nottingham*
 Jungong Hana – *University of Sheffield*

Project Partner Organisations:

NTU Home Farm, Kinnordy Estate, Microsoft Research



Building a predictive model of all plant and animal life on earth

This project is developing a model of the planet called “Terra” that will be able to make predictions for a great many rare plant and animal species on which we currently have only sparse data.

It will also enable monitoring of biodiversity at much higher resolution and accuracy than is currently possible, to help avert the extinction crisis.

The project brings together a team of computer scientists, plant scientists, ecologists and physicists to build a suite of critically important predictions about life across our planet for extinction risks and where and how these might be most efficiently mitigated. The Terra model will be combined with world data, such as food supply chains, to identify threats to biodiversity to provide vital information to policy makers to understand impact of food production and consumption.



Project Lead and Co-Leads:

Anil Madhavapeddy, Srinivasan Keshav, David A. Coomes, Andrew Balmford, Michael Dales, Sadiq Jaffer, Tom Swinfield – *University of Cambridge*
Neil Burgess – *UNEP- World Conservation Monitoring Centre*

Project Partner Organisations:

Mantle Labs Ltd, Royal Botanic Gardens Kew, Stockholm Environmental Institute

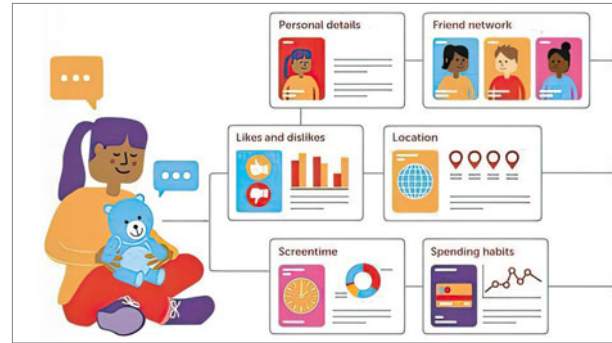


GRASPING DATA: Co-creating physicalizations to empower young children to interact with, understand, and benefit from their personal data

The Grasping Data project will change how we think about children and their personal data. It will go beyond current emphases on protection and privacy to explore how children of 3 to 8 years might first understand, enjoy, and value their personal data, such as their age, location, and preferences to how active, talkative, or playful they are.

We will achieve this by working together closely with children, their parents and educators, and bringing together diverse research expertise including early learning, ethics, data visualization and engineering, to co-develop new ways to physically represent personal data that children can touch, explore, talk about and learn with.

Children will better understand their data-saturated world and have greater confidence that they should and can play a role in the design of their futures.



Project Lead and Co-Leads:

Andrew Manches, Ayça Atabey, Cara Wilson, Uta Hinrichs,
Lydia Plowman – *University of Edinburgh*
Stephen Brewster – *University of Glasgow*

Project Partner Organisations:

SSERC, Edinburgh Zoo, Glasgow Science Centre.



THE UNIVERSITY
of EDINBURGH



University
of Glasgow



GLASGOW
SCIENCE
CENTRE



Sensing on urban noise: distributed sensing for collaborative and sustainable cityscapes and living environments

Unused legacy optical fibre cables can be used as a cheap method for urban monitoring, sensing vibrations and sound through Distributed Acoustic Sensing technologies. Recent proposals have been made to expand the technology's use to monitor traffic, crowds, buildings' integrity, and transportation networks and could lead to smarter urban development.

However, there are important concerns around data privacy, AI ethics, equitable technology access, sustainability, climate impact, social inequality, and citizen participation in decision-making processes.

This project integrates citizen participation early in the process of technology development to guide decisions democratically and ensuring that the research benefits are aligned with societal needs.



Project Lead and Co-Leads:

Rafael Mestre, Mohammad Belal, Alexandra Anikina, Dianna Smith,
Matt Ryan – *University of Southampton*
Ceri Davies – *National Centre for Social Research*

Project Partner Organisations:

National Oceanography Centre, National Centre for Social Research



Converting historical knowledge into sustainable ocean management

Atlantic herring are a fundamentally important component of the marine ecosystem in the northeast Atlantic which collapsed in the mid-20th century.

The FiSHistory project will bring together historians and marine scientists to convert historical observations of fishers, past and present, into knowledge that will inform marine ecosystem management.

Ecologically important herring spawning areas will be identified using historical sources, mostly from the 17th to the early 20th centuries, including the writings of early modern naturalists and travellers, newspaper archives, government inquiries and the memory of living fishers. The learnings will also improve our understanding of the long-term variations in spawning activity in response to changing climates.



Project Lead and Co-Leads:
Alec Moore, Jan Hiddink, Shaun Evans, Lee Raye – Bangor University

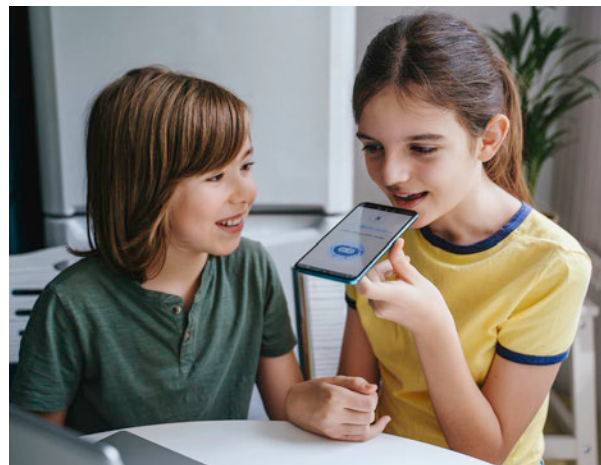
Project Partner Organisations:
Natural Resources Wales, Isle of Man Government Department of Fisheries and Agriculture



CHAILD: Children's Agency In the age of AI

The CHAILD project aims to address the critical issue of fostering children's digital autonomy when their childhood is increasingly intertwined with Artificial Intelligence (AI) systems, such as connected toys, apps, voice assistants, and online learning platforms. While AI offers great opportunities, it also poses significant risks to children's autonomy and agency.

CHAILD will bring together a world-leading team of computer scientists, learning scientists, social scientists, philosophers, and public policy partners to define what agency means for children in the digital age. It will develop new AI systems that empower children with controls and co-produce actionable design and policy guidelines with key stakeholders in this space.



Project Lead and Co-Leads:

Nigel Shadbolt, Jun Zhao, Carina Prunkl – *University of Oxford*
Manolis Mavrikis, Wayne Holmes – *University College London*

Project Partner Organisation:

Baroness Beeban Kidron



Feeling the untouchable: Haptic touch experiences for naturalistic learning

As we confront the global sustainability challenges of our time, schools need to address the issue of disassociation with the natural world that is part of modern culture.

This project will co-design new and inclusive touch-based teaching methods that include digital haptic experiences to engage students in personally relevant, immersive and multimodal explorations of the natural world. These will help children in constructing conceptual models, while creating cognitive and affective connections between science curriculums and issues of societal relevance.

Improving teaching methods through touch could lead to meaningful integration of technology into nature-based curricula, increasing the complexity in children's observations and understandings of the natural world, and ultimately, actions to support the planet.



Project Lead and Co-Leads:

Advait Siddharthan, Lisa Bowers, Nirwan Sharma, Stefan Ruegers – *The Open University*
 Poppy Lakeman Frase – *Imperial College London*
 Andrew Manches, Laura Colucci-Gray – *University of Edinburgh*

Project Partner Organisations:

Learning for Sustainability SCOTLAND, Sight Scotland



IMPERIAL



When Memories Come Alive: An interdisciplinary study of the vividness of memory

What does it feel like to have a memory? Surprisingly little is known about how we can vividly relive past events, which functions of the brain are involved, and how these processes vary across individuals, societies and cultures.

This project is an interdisciplinary study of the human experience bringing together psychology, cognitive neuroscience, literary studies and history.

It will drive a step-change both in understanding memory vividness and the associated brain mechanisms across the life-course, and in enhancing the interpretation of vividness in literary and historical works dating back to the early modern era.



Project Lead and Co-Leads:

Jon Simons, Alexandra Walsham, Raphael Lyne – *University of Cambridge*

Charles Fernyhough – *Durham University*



ANIMATING MINDS: Triangulating the age-appropriate impact of children's media

How can we know whether a cartoon is "age-appropriate" for young children to watch? Currently we rely on the craft intuitions of animators minimally informed by child development to create appropriate content for children of different ages.

As childhood media experiences proliferate, we need methods for directly testing and predicting the impacts of media content.

The Animating Minds project will bring together a unique team of animators, developmental neuroscientists, computer scientists and media theorists to develop a computational tool for predicting the direct impact of videos on child cognition at different ages.



Project Lead and Co-Leads:

Tim J. Smith, Mick Grierson – *University of the Arts London*
 Rachael Bedford – *Queen Mary University of London*
 Paul Taberham – *Arts University Bournemouth*
 Paola Pinti – *Birkbeck, University of London*
 Sergio Benini – *University of Brescia*

Project Partner Organisations:

Beakus, Plastic Milk, Early Years Alliance, Animation UK, Sandbox Kids, BlueZoo, Children's Media Foundation



Justice, Energy, Demand flexibility and AI for sustainability (JED-AI)

Can AI help build people's capacity to benefit from more flexible forms of energy use?

Low Carbon Technologies , such as solar panels, electric vehicles, heat pumps, smart energy-efficient appliances and AI-driven energy management solutions, are a key part of the transition to Net Zero.

Previous large-scale studies, however, have shown increasing divides in household capabilities, across income, age, and home ownership groups, to adapt quickly to these technologies.

JED-AI will integrate engineering and social science analyses to co-design AI-driven recommendations for energy demand flexibility, enabling more informed choices and contributing to a smarter, fairer and more sustainable transition to Net Zero.



Project Lead and Co-Leads:

Vladimir Stankovic, Lina Stankovic – University of Strathclyde
Philipp Grunewald, Charlie Wilson – University of Oxford
Tom Hargreaves – University of East Anglia

Project Partner Organisations:

Energy Systems Catapult and Hugo Technologies Limited



Satellite-Aided Technologies for Guarding energy services under climate hazards, risks, and disasters (SAT-Guard)

The transition towards a sustainable energy system in the UK requires a comprehensive, equitable, and inclusive strategy that considers the environmental, economic, and social aspects of future energy systems. The power grid is increasingly vulnerable to climate-related hazards such as storms, which pose a significant risk to the continuity of power supply and our communities.

The SAT-Guard project aims to address multifaceted challenges through the development of innovative satellite-aided mechanisms designed to proactively manage power grids. The system will enable flexible and socially-conscious energy management, and ensure swift and efficient power supply restoration following climate-related hazards. SAT-Guard seeks to pioneer a path towards a resilient, equitable, and sustainable energy future for the UK.



Project Lead and Co-Leads:

Hongjian Sun, Bruce Malamud, Simone Abram, Daniel Donoghue,
 – *Durham University*
 Jing Jiang, Eamon Scullion – *Northumbria University*

Project Partner Organisations:

Northern Gas Networks, Mithrasol Energy, Moxie Energy Group
 and FutureZero Consulting

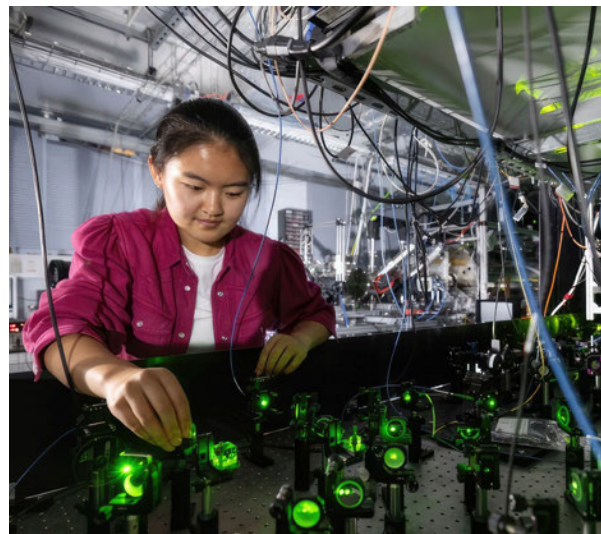


Testing fundamental physics using arrays of ultracold molecules

There is virtually no antimatter in the visible Universe. This asymmetry between matter and antimatter is one of the greatest mysteries in science and points to new forces yet to be discovered. Because they violate a symmetry, these new forces give electrons inside molecules an asymmetric shape.

The interdisciplinary research team brings together expertise from particle physics and quantum science that will allow molecules to be cooled to near absolute zero so that they are still enough to measure.

The advancement of state of the art precision quantum measurement and the analytical tools will influence new theories of physics.



Project Lead and Co-Leads:

Michael Tarbutt, Oliver Buchmueller, Jongseok Lim and Ben Sauer
– Imperial College London

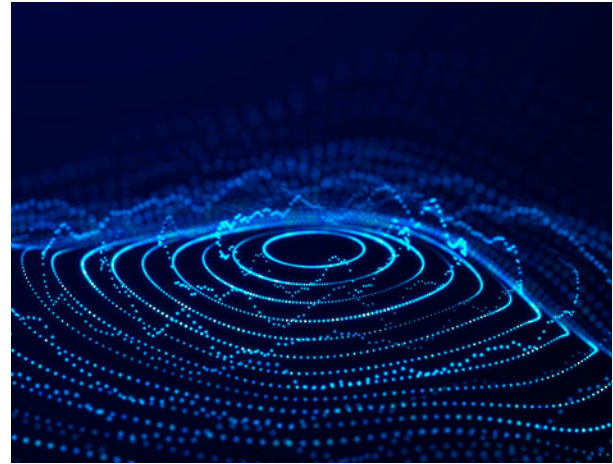
IMPERIAL

Sonic Intangibles: sonification hub for innovation in sound and meaning

Sonification is a method of representing data through sound that can bring the intangible, such as distant galaxies, computer network traffic, the Earth's magnetosphere, or the quantum states of materials into our audible experience.

The project brings together computer scientists, musicians, observational astronomers, mathematicians, and materials scientists and will establish sonification as an interdisciplinary practice that can be widely utilised for exploring data, representing intangible data and phenomena, and providing new embodied experiences through sound.

The project will lay the foundations of a UK interdisciplinary hub that leads the global agenda in sonification research and, through public concerts, installations, talks, and workshops, will foster public understanding of sonification's potential.



Project Lead and Co-Leads:

Paul Vickers, Daniel Ratliff, Lucy Whalley – *Northumbria University*
Christopher Harrison, Bennett Hogg – *Newcastle University*

Project Partner Organisations:

Orbyts



LOCAST: Enabling Low-Carbon Structures by Understanding Human Effects of Motion

Tall buildings currently use far more material than needed for safety, especially carbon-intensive concrete and steel. This is to ensure occupants don't feel any sway motion, even in strong winds.

The LOCAST project questions this approach by rigorously measuring, for the first time, what sway motion building occupants can feel, and how this affects their wellbeing and workplace performance.

The project will also mechanistically assess the role of physiology in how motion affects people. The aim is to inform next generation design guidance for future lower carbon buildings.



Project Lead and Co-Leads:

Ian Walker – *Swansea University*

Antony Darby – *University of Bath*

Jennifer Davis, Cathy Holt – *Cardiff University*

Alexander Pavic – *University of Exeter*

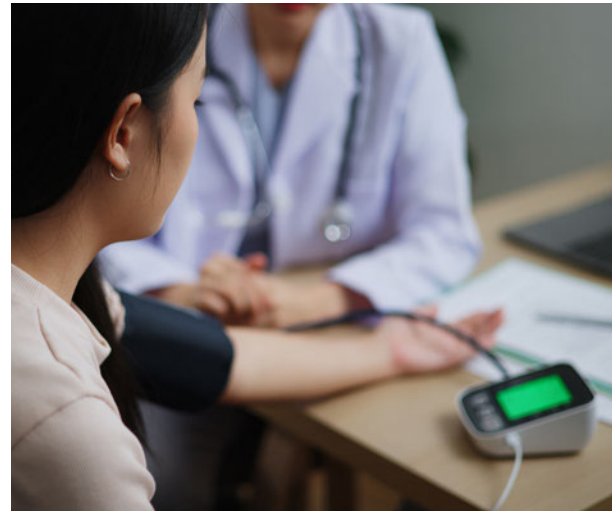


Learning molecular trajectories of pulmonary hypertension patients

Pulmonary Hypertension (PH) is a complex disease that is associated with a range of diseases and causes, such as molecular, life style and environmental, that can change over time and leads to poor prognosis.

The project aims to use machine learning and longitudinal molecular data to predict the progression of PH. By combining clinical, molecular, and time-series data, we will develop robust models to forecast future symptoms and molecular changes in patients.

This interdisciplinary approach, integrating medicine, biology, epidemiology, and engineering, has the potential to improve diagnostics, identify new biomarkers, and enable more cost-effective and personalized treatments for PH and other complex diseases.



Project Lead and Co-Leads:

Dennis Wang, Allan Lawrie, Martin Wilkins – *Imperial College London*
Mauricio Alvarez – *University of Manchester*
Varsha Gupta – *A*STAR IHDP (Singapore)*

IMPERIAL



Interdisciplinary systematic review: mechanistic evidence and epistemic justice

What is the best way to evaluate whether an intervention works? Traditional 'evidence-based' evaluation methods take into account particular types of studies, especially randomised trials, but exclude other relevant evidence, such as mechanistic studies and views of stakeholders. The assumption that randomised trial evidence can stand alone led to untrustworthy conclusions about the efficacy of masks during the COVID-19 pandemic.

This project will develop a broader approach to evidence review, one that includes a diverse range of evidence from across disciplines. The new methods promise better informed evaluations that take stakeholder evidence into account, improving how interventions and policies are implemented. A new review of the effectiveness of face-mask mandates will be used to test the approach.



Project Lead and Co-Leads:

Jon Williamson – *University of Manchester*

Trish Greenhalgh – *University of Oxford*

Rebecca Helm – *University of Exeter*

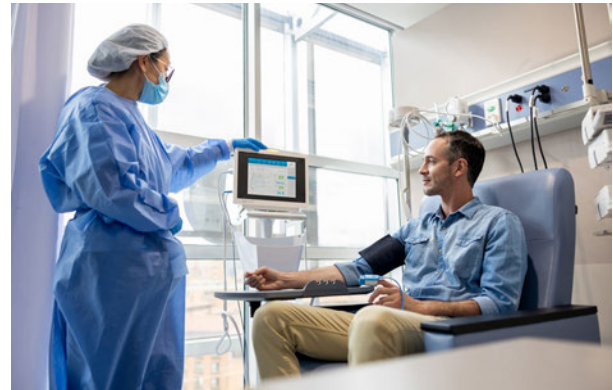


High resolution molecular profiling platform to investigate the role of tumour microbiota in anti-tumour immunity

Increasing research shows that cancer development and responses to treatment, such as immunotherapy, are linked to each patient's unique tumour microenvironment.

This project will harness advanced imaging and molecular techniques, AI-driven image analysis, and bioinformatics tools to map the biological processes driving ovarian cancer. New microfluidic methods will be used for in-depth scrutiny of the intratumour microbiome. Together, these approaches will enable a highly holistic view of cancer cell biology with high spatial resolution and detailed molecular information.

Finding ways to predict which patients respond to immunotherapies and the development of new therapies to revert immunosuppression could be a game changer for the treatment cancer patients.



Project Lead and Co-Leads:

Huabing Yin, Sara Zanivan, Umer Zeeshan Ijaz – *University of Glasgow*
Josephine Bunch – *National Physical Laboratory*
Wei Huang – *University of Oxford*

Project Partner Organisations:

University of Leicester, Beatson West of Scotland Cancer Center





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UK Research
and Innovation

Awarded projects
from round 2 of the Cross
Research Council Responsive
Mode pilot scheme





Arts and
Humanities
Research Council



Biotechnology and
Biological Sciences
Research Council



Engineering and
Physical Sciences
Research Council



Economic
and Social
Research Council



Medical
Research
Council



Natural
Environment
Research Council



Science and
Technology
Facilities Council

The cross-research council responsive mode (CRCRM) pilot scheme supported high potential interdisciplinary research proposals that embrace new concepts, techniques or technologies. Its focus was on support for breakthrough or disruptive ideas and collaborations that span the remits of multiple UKRI research councils, to ensure all forms of interdisciplinary research have a home within UKRI. £65 million was awarded through the pilot scheme across two rounds.

The CRCRM scheme was designed to stimulate exciting new research by supporting projects that require deep interdisciplinary collaboration to address complex challenges .

An Interdisciplinary Assessment College (IAC), comprising members with experience of working in or supporting interdisciplinary research, was appointed and specifically trained for the assessment of applications to the scheme.

Insights from the CRCRM pilot scheme will inform UKRI's future approach to supporting interdisciplinary research.

Foreword

The perspectives of different disciplines, working together in collaboration, are vital to solving some of the most pressing problems we face as a society. The UKRI cross research council responsive mode pilot scheme (CRCRM) was designed to break down silos and champion research that transcends, combines and significantly spans traditional discipline boundaries.

This booklet summarises the 32 projects funded through round 2 of the CRCRM pilot scheme. Each project demonstrates genuine co-creation and integration, with reciprocal benefits and learning across the disciplines involved, creating fresh approaches to research questions, methodologies and ways of working, that push the boundaries of current research.

UKRI and our appointed Interdisciplinary Assessment College were genuinely excited to see the innovative and bold approaches being adopted, and the breadth of issues being tackled - from climate change to global healthcare. We look forward to following their progress.

In addition to generating innovative and exciting new research projects, insights from the CRCRM pilot scheme will inform UKRI's future approach to funding interdisciplinary research.



Professor Alison Park

UKRI CRCRM Champion

Deputy Executive Chair of the Economic and Social Research Council (ESRC)



Dr Alexandra Amey

Strategic Lead Interdisciplinary Research UKRI

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Ultrasound-guided activation and imaging of engineered bacteria for stroma reprogramming

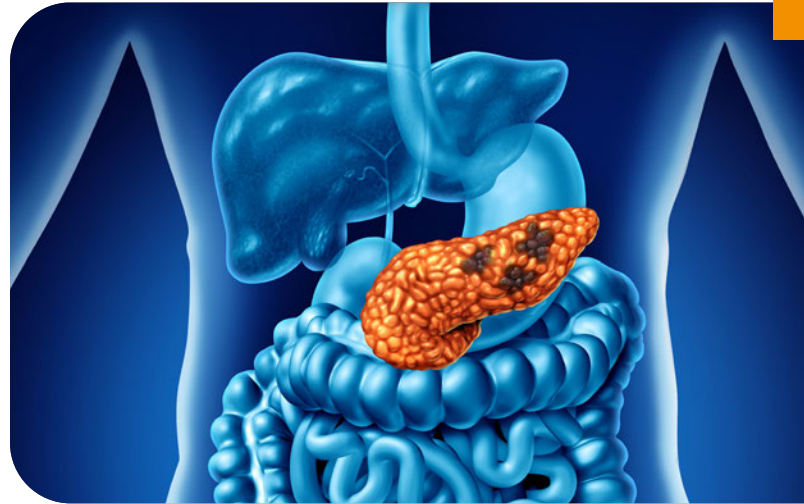
Survival rates for most cancers have doubled since 1980, but some pancreatic cancers still have almost no successful therapies.

Our novel approach to pancreatic cancer treatment will harness the power of specifically engineered bacteria to modify the immune environment around the tumour, enabling the patients' own immune system to target the cancer.

We will do this by encapsulating the harmless bacteria in a gel-like material which can be injected close to the cancer site. On the application of ultrasound, the bacteria will release compounds designed to modify the cells around the tumour.

This project brings together material chemistry, synthetic biology, engineering physics and experimental medicine to create an entirely new technology to treat pancreatic cancers.

This approach enables clinicians to monitor therapies non-invasively, and removes the use of toxic anti-cancer drugs, thus reducing side-effects which can be so debilitating to patients.



Project Lead and Co-Leads:

Cameron Alexander and Jennifer Ashworth – *University of Nottingham*
Ljiljana Fruk, Bristi Basu and Graham Christie – *University of Cambridge*
Helen Mulvana – *University of Glasgow*

Project Partner Organisations:

Cambridge Experimental Cancer Centre
PeptiMatrix Ltd



Reframing climate change impact modelling and adaptation in the Global South through integration of indigenous knowledge with climate models

Many Global Southern regions, such as the Sahara Desert in Africa, lack the historic weather station records climate modellers need for future climate impact studies and weather hazard warning systems. However, several Saharan regions have rich oral traditions that encapsulate historical weather through poetry and meteorological know-how.

This project will develop a transferable methodology for integrating climate information from Indigenous oral traditions into contemporary climate models and establish a new climate monitoring network in western Sahara. The project brings together an interdisciplinary team of humanities scholars, climate scientists, nomad-poets and policymakers and will improve future climate change projections in data scarce regions to support the adaptation of vulnerable populations to the impacts of global warming.



Project Lead and Co-Leads:

Joanna Allan, Ben Brock – *Northumbria University*
Hayley Fowler – *Newcastle University*
Tom Matthews – *King's College London*
Sebastien Boulay – *Sorbonne Paris Cité*
Francois Engelbrecht, Stefan Grab – *University of the Witwatersrand*

Project Partner Organisations:

British Library, L'Office National de la Météorologie de Mauritanie, Sahrawi Ministry for Water and Environment, Sahrawi Republic Representation to the African Union

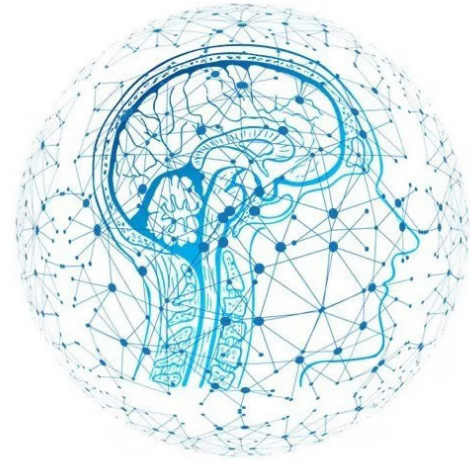


Navigating the neural frontier: embedding ethics and epistemology in neurotechnology

Neurotechnologies that read from and stimulate the brain are moving quickly from lab to everyday use, and in a way that promises restored function and cognitive enhancement. But they also raise new risks related to manipulation, misinformation, and loss of autonomy.

This project brings together philosophers, neuroscientists and engineers to co-develop neurotech and the ethical and knowledge-related frameworks needed to use them responsibly. We will build tools for assessing risk, to explore how trust in neurotech is built and to understand the effects on authenticity. These tools will be tested alongside experiments in memory stimulation and brain-computer interfaces.

These tools will inform the safer design and policies to develop neurotechnology in a responsible way and will train the new generation of 'neurophilosophical engineers'.



Project Lead and Co-Leads:

J Adam Carter, Simon Hanslmayr, Christoph Kelp, Daniele Faccio, Emma Gordon, Lars Muckli, Monika Harvey – *University of Glasgow*
Mona Simion – *University of Oxford*

Project Partner Organisations:

Cogito Epistemology Research Centre, Centre for Neurotechnology, Kernel (Los Angeles, USA), Clarity Technologies (Paris, France)



kernel



Economic early-warning signals of accelerated climate change and Earth-system tipping-points

Insurance and reinsurance underpin the global economy. The growing risks posed by climate change, such as increases in the frequency or severity of flooding, place insurance at the frontline of where climate impacts hit the real economy.

This project will develop and test a novel early-warning system for accelerating climate change and when we may be approaching tipping-points. It will provide information to policy makers and wider society so that we can prepare for levels of climate change that could become unmanageable, and lead to a variety of harmful impacts.

We will create interdisciplinary multi-dimensional storylines, combining physical climate change, policy and regulatory changes linked to the net zero transition and their potential geopolitical impacts.

Improved early-warning will enable the management of climate risks to ensure a resilient future.



Project Lead and Co-Leads:

Iain Clacher, Helen Hughes, Jason Lowe, Richard Beardsworth, Anubhav Choudhar – *University of Leeds*
Sarah Sparrow – *University of Oxford*
Helen Roberts – *Met Office*

Project Partner Organisations:

Aon, JBA Risk Management, Liberty Mutual, Lloyds Banking Group, Lloyds Market Association, Maximum Information, MS Amlin, OAK Re, Oasis LMF.



UNIVERSITY OF LEEDS



Causation in law and statistics

Lawyers use qualitative models and natural language to assess causation in the individual case, while statisticians use mathematical models and data analysis to identify population level effects.

Despite their differences, the two disciplines increasingly interact. Courts are being called upon to assess statistical evidence when determining issues of legal liability, while statisticians are developing formal models that seek to capture causal mechanisms at the individual level.

This project will explore the divergent approaches to causation used in both law and statistics and identify the scope for learning across disciplines, advancing the state of the art in both.

We will explore historical and contemporary data and develop new statistical models for use in legal claims including those arising from workplace injuries.



Project Lead and Co-Leads:
Simon Deakin, Qingyuan Zhao, Martina Scauda and Linda Shuku –
University of Cambridge



Single-cell metallomics to understand how metals regulate biology

Metals in living organisms (biometals) are essential for the health of both individual cells and entire ecosystems. Iron deficiency alone affects the health of billions of people and limits global ecological productivity.

This project bridges Earth and medical sciences to address how differences in metal use at the cellular level affects health and ecology at scale. To explore the therapeutic and environmental impacts, we will measure metal levels in a variety of single cells from bacteria, algae, and human white blood cells and cancer cells and track how iron moves through them.

By linking facilities and sharing data between biomedical and ecological research, we aim to reveal how metals influence metabolism, disease, and ecosystem stability. Our project marks a new interdisciplinary approach in advancing metal biology.



Project Lead and Co-Leads:

Hal Drakesmith – MRC Weatherall Institute of Molecular Medicine,
Radcliffe Department of Medicine, University of Oxford

Jon Wade – Department of Earth Sciences, University of Oxford



Pharmaceutical reduction in the water environment through sustainable healthcare

Pharmaceutical pollution in the water environment is an internationally recognised public health and environmental issue. Pollution arises across the pharmaceutical lifecycle, from prescribing, use, disposal, and wastewater treatment. To comply with evolving regulations, the healthcare and water sectors face mounting pressures to improve practices, reduce costs, and deliver environmental sustainability targets.

We will apply a systems-based approach to tackle pollution at multiple stages of the pharmaceutical lifecycle. Interdisciplinary researchers and practitioners together will co-develop strategies for predictive risk modelling, behaviour change interventions, reduction technologies, and shared decision-making.

The project will provide evidence and resources to inform actions across the healthcare, water and environment sectors in tackling the pharmaceutical pollution challenge and safeguarding environmental and human health.



Project Lead and Co-Leads:

Stuart Gibb, Alistair Kean, Szabolcs Pap, Lydia Niemi – *University of the Highlands and Islands*
Miriam Glendell, Eulyn Pagaling, Kerr Adams – *The James Hutton Institute*
Claire Anderson, Naoko Arakawa – *University of Nottingham*
Sharon Pflieger, Kenneth Barker – *NHS Highland*
Teresa Fernandes – *Heriot Watt University*
Ian Megson – *University of St Andrews*

Project Partner Organisations:

Scottish Water, Scottish Environment Protection Agency, Uppsala University



An immersive digital art platform to align clinical & psychological benefit for children having repeated medical interventions

Recurrent medical procedures in young children with chronic conditions often lead to feelings of fear and loss of control, which build over time. This creates a negative cycle that damages wellbeing, inhibits cooperation and undermines clinical success.

To break this cycle, the project will use novel technology to develop an immersive artform called “Asymmetric Reframed Reality” that enables children to experience the same medical procedures in a new, more positive way by reframing their reality.

To achieve this, we will digitally map the child’s clinical surroundings during live procedures and fuse this with an interactive Virtual Reality world to continuously generate a precisely matching, yet totally different scene.

This project brings together clinical paediatrics, psychology and biomedical engineering with digital art and immersive technology to unlock new creative possibilities to transform children’s clinical experiences leading to more positive experiences and improved medical outcomes.



Project Lead and Co-Leads:

Jo Hajnal, Emily Jones, Ildar Farkhatdinov, Kun Qian & Tomoki Arichi –
King’s College London
Marco Gillies, William Latham & Xueni Pan – *Goldsmiths, University
of London*

Project Partner Organisations:

Evelina Children’s Hospital, The Royal Marsden Hospital
University of Maryland, Nottingham Trent University

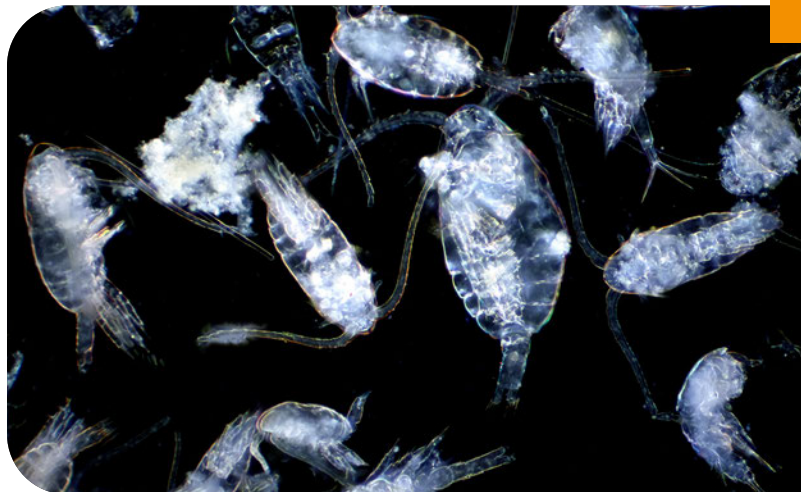
Calanus as vectors of pharmaceuticals and contaminants in the marine environment

The discharge of contaminants such as metals, pharmaceuticals, and petrochemicals can result in a wide range of impacts for marine life and human health.

Calanus, a group of marine copepods, play a vital role in energy transfer through the marine food web. By feeding on phytoplankton and creating large lipid reserves, they create a rich, fat-based resource that fuels much of the North Atlantic's biodiversity. Critically, these lipid reserves can provide routes for the accumulation of contaminants directly from the water or through contaminated phytoplankton.

In this project, we will bring together pharmacology, oceanography, behavioural ecology, ecotoxicology, pollution and social science to evaluate the multiple pathways through which Calanus transports contaminants and develop a new model species for understanding contaminant uptake and pathways in the marine environment through ecosystems to humans.

This will help healthcare providers and environmental and food agencies better understand how marine contaminants travel, supporting more environmentally conscious policy making.



Project Lead and Co-Leads:

Laura Hobbs, Helena Reinardy, Kim Last, Suzannah-Lynn Billing –
Scottish Association for Marine Science
Stuart Gibb – *University of the Highlands and Islands*
Neil Banas – *University of Strathclyde*
Rebecca St Clair – *University of Leeds*
Sharon Pflieger – *NHS Highland*



Towards a meaningful sound-based interaction with plants

Plants respond to and generate sound, especially when under stress, but we still know surprisingly little about how this works. Understanding plant sounds may enable early detection of stress, such as drought or nutrient deficiencies, which impacts crop health. Noise may also disturb plant life and the interactions with pollinators they rely on to reproduce.

To unlock our understanding, we need robust, trustworthy evidence, which requires an interdisciplinary approach. This project brings together acousticians, biologists, and engineers to explain the mechanisms and role of sound in plants.

Combining experiments with cutting-edge modelling, this project will create a strong foundation for sound-based sensing and pollination protection, enhancing plant health and reinforcing food security in the face of climate change.



Project Lead and Co-Leads:

Michal Kalkowski, Tiina Roose, William King, Chaitanya Paruchuri, Siul Ruiz, Daniel Stabler, Matthew Terry – *University of Southampton*

Entrepreneurship, art and science for environmental sustainability developing better tools for communicating the climate crisis

Despite the urgency of the climate crisis, scientific communication often fails to connect emotionally with the public. This project bridges Earth sciences, creative arts, and business entrepreneurship to produce a novel approach to create emotionally resonant, scalable communication tools.

The interdisciplinary team will embed artists directly into scientific fieldwork to develop and market-test innovative prototypes from immersive installations to digital narratives.

By transforming the complex science of ancient climate data preserved in stalagmites, sediments and tree rings into accessible experiences, this project will drive deep public engagement, inspire behaviour change, and influence environmental policy, creating a sustainable model for future science communication.



Project Lead and Co-Leads:

Mark Kasumovic – *De Montfort University*
James Bendle – *University of Birmingham*
Xiao Ma, Iryna Kuksa – *Nottingham Trent University*
Michael Pinsky – *University of East London*
Andrea Shapland – *University of Oxford*
Kirsty Robertson – *University of Western Ontario*

Project Partner Organisations:

Photoworks UK, Sitia UNESCO Global Geopark, Psiloritis UNESCO Global Geopark, Hellenic Institute of Speleological Research, Ephorate of Antiquities of Heraklion, University of Patras, British School at Athens, Northumbria University

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EAST LONDON

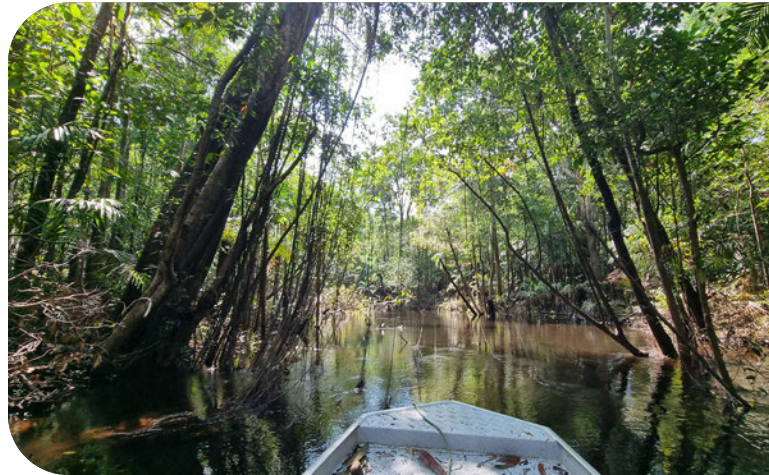
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OXFORD

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Fish, fishers and finances: working with Brazilian traditional communities to improve the ornamental fish trade

The global ornamental fish trade generates up to \$20 billion annually. It is a vital livelihood for many Amazonian communities and incentivises rainforest conservation. However, the trade is declining due to poor and inconsistent compensation, shifting markets, and welfare concerns that favour farmed alternatives, threatening both local economies and environmental protection.

This interdisciplinary project will work with fishing communities to identify welfare and economic bottlenecks across the supply chain and test low-cost, evidence-based improvements to reduce fish stress and mortality. Fishers will be supported with simple monitoring tools, and UK consumer surveys will assess willingness to pay for higher-welfare fish. By integrating biological, social, and economic approaches, the project aims to create a more ethical, profitable, and conservation-driven ornamental fish trade.



Project Lead and Co-Leads:

Shaun Killen, Nick Hanley – *University of Glasgow*
Daiani Kichhann – *State University of Vale do Acaraú*
Katherine Sloman – *University of the West of Scotland*

Project Partner Organisations:

Federal University of Amazonas, National Institute of Amazonian Research, Office of the Secretary of Fisheries in Amazonas State, Olivier Leger Ltd, Ornamental Aquatic Trade Association, Project Piaba, Waltham Petcare Science Institute

Health and environmental impacts of particulate emissions from tyres

Tyres create over 30% of the world's microplastic pollution. For a modern combustion-engined car pollution from tyres accounts for over a third of the airborne particulate matter. However, electric vehicles will produce more of this pollution due to their increased mass and torque generation.

Upcoming emissions standards aim to limit the amount of this pollution, based on the assumption that minimising quantity of particulate matter in the air will minimise harm to human health and the environment. In contrast, knowledge from microbiologists and environmental scientists suggests that the level of harm may also depend on the size, shape, chemical composition and dispersion of particulates. These characteristics are influenced by tyre and road surface design and the physics of their interaction.

This project will bring together engineering, biological and environmental sciences to explore the link between tyre pollution generation, particulate characteristics and their impacts. This knowledge is essential to designing future tyres and legislation that will minimise the effects of tyre pollution on people and places.



Project Lead and Co-Leads:

James Knowles, Fiona Hatton, Daniel O'Boy, Georgios Mavros, Thomas Stanton – *Loughborough University*
Julie Morrissey – *University of Leicester*

Project Partner Organisations:

Department for Transport, Health Security Agency, Environment Agency



Reframing ecological land evaluation in Zimbabwe

Conventional agricultural research often overlooks how rural communities understand and manage their soils and crops. In many African settings, recommendations for land management still reflect colonial-era ideas that marginalised local knowledge and contributed to unequal and unjust land use.

This project brings together historians, soil scientists, social scientists, linguists and crop modellers to explore how inherited assumptions continue to shape farming and land management today. We will work with rural communities in Zimbabwe to develop new ways of producing soil and crop knowledge together, combining scientific research with indigenous histories, languages and practical experience. By doing so, the project aims to support fairer, more sustainable decisions about land and agriculture.



Project Lead and Co-Leads:

Murray Lark – *University of Nottingham*
Alice Milne, Grace Kangara – *Rothamsted Research Hatirarami Nezomba*
– *University of Zimbabwe*

Project Partner Organisations:

Integral Kumusha Foundation, Zimbabwe National Geospatial and Space Agency, Agriculture Research, Education and Specialist Services
– *Agronomy Research Institute*







Neurocognitive AI models for combating misinformation in diverse societies

Misinformation can be more convincing than official facts, eroding public trust. The challenge is magnified in cities with diverse populations as messages move through cultural and linguistic networks, and a change that reaches one group may never reach another.

Most existing countermeasures to misinformation do not sufficiently consider that the human brain tends to respond emotionally, not deliberately, to new information, and that an individual's experiences shape their emotional response.

Our project uses brain imaging to observe how individuals from varied backgrounds respond to trustworthy and false digital content. By bringing neuroscience together with artificial intelligence, social policy and political science, these images will be used to build an AI model that will help individuals recognise when they are at risk of emotionally responding to information and help them activate their critical thinking skills.



Project Lead and Co-Leads:

René Lindstädt, Jennifer Cook, Slava Jankin, Paolo Missier, Matthew Bennett – *University of Birmingham*

Project Partner Organisations:

The Cabinet Office, Birmingham City Council, National Police Chiefs' Council, Alliance of Democracies Foundation, Democracy International, Folke Bernadotte Academy, The Martti Ahtisaari Peace Foundation, The Jabbs Foundation, University College London



Microfluidic approach for rapid discovery of enzymes for microplastic breakdown and environmental impacts

Microplastic pollution is a growing global challenge, with harmful effects on the environment, particularly our oceans. Tackling this problem requires new solutions to safely breakdown plastics to prevent further damage.

This project is developing state of the art methods in microfluidic enzyme evolution to create and test new enzymes that can break down different types of plastics, including new bio-based materials. We will also identify and test how the products released from this process affect marine organisms to ensure they are safe.

This work brings together complimentary expertise in biophysics, biochemistry, chemical synthesis and ecotoxicology to develop the technology to allow the testing of a high number of enzymes and help drive the creation of new 'safe-by-design' plastics.



The picture on the right shows a droplet with mixed microplastics and enzymes inside. This project will rapidly optimise the enzymes to breakdown the plastic targets, such as PET, which is widely used in packaging.

Project Lead and Co-Leads:

Jennifer Littlechild, Fabrice Gielen, Tamara Galloway, Mark Wood –
University of Exeter

Co-produced characterisation of affective thoughts in ageing and dementia research

There is a growing burden of mental illness and dementia in an ageing UK population. There is an urgent need to identify lifestyle and behavioural risks and to develop early interventions.

The way people think acts as a strong predictor of age-related mental health and dementia risk. This project will explore which types of thoughts could be used as early risk indicators.

We will develop a novel, reliable and valid artificial intelligence-based tool to characterise thoughts, and to determine which thought characteristics are related to age-related cognitive, mental and brain health.

It integrates diverse knowledge from psychologists, clinicians, people with lived experience, computer scientists and statisticians.

By combining human expertise with modern technology, we will produce new methods and evidence to help identify mental illness and neurodegenerative risk, and to support scalable approaches to promote better health outcomes.



Project Lead and Co-Leads:

Natalie Marchant, Takoua Jendoubi, Andrew Sommerlad, Gabriella Vigliocco – *University College London*
Nishanth Sastry, Suparna De, Diptesh Kanojia – *University of Surrey*
Harriet Demnitz-King – *Queen Mary University of London*

Project Partner Organisations:

Ione Fraser



MoonRISE: Re-imagining space environments through an integrated governance approach

This project addresses the challenge of lunar governance at a time of intensified activities on the Moon. Planned crewed explorations will require infrastructure and use of the moon's resources leading to changes in the lunar environment. This must be balanced against protecting sites on the Moon that are significant for scientific, environmental and cultural reasons.

This project evaluates proposals for lunar governance based on earthly models, and creates a policy-relevant framework informed by astrobiology, lunar science, geography, law and ethics to shape effective management and protection of the lunar environment. It will map and define sites of special interest for cultural and natural heritage and create guidelines that will advance knowledge on how to protect the integrity of the Moon.



Project Lead and Co-Leads:

Alessandra Marino, Karen Olsson-Francis, Mahesh Anand, Marjan Ajevski, Nick Bingham, Peter Fawdon, Derek Matravers, Hannah Cooper – *The Open University*
Ian Crawford – *Birkbeck, University of London*

Project Partner Organisations:

ESSI, NASA SSERVI



Snail-inspired soft robots for high precision drug delivery to malignant tumours

Colorectal cancer (CRC) is a rising public health threat in the UK with approximately 44,000 cases per year and is the second most common cause of cancer deaths.

Taking inspiration from snail locomotion, this project will develop soft robots capable of delivering drugs to specific regions of the colon or rectum for CRC therapy. It will use an interdisciplinary approach combining biomechanics, bionanomaterials, robotics, and cancer biology.

Computer simulations and studies of live snails will provide information on their movement to design and build robots for the controlled and precise delivery of targeted treatments to malignant tissues.

This approach overcomes the key limitations of current drug delivery systems by directly targeting the cancerous tissues which enhances the treatment and minimises side effects for the patients.



Project Lead and Co-Leads:

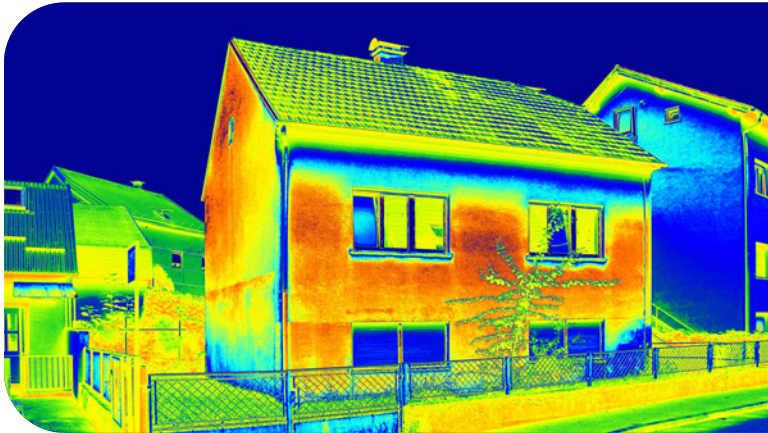
Mostafa Nabawy, William Sellers, Mohamed Elsayy, Lee Margetts, Katherine Finegan - The University of Manchester

Socio-spatial thermal justice, a new analytics model for navigating polycrises

Human exposure to thermal extremes is linked to rising chronic health conditions, hospital admissions and in some instances tragically death. Combined with climate change and the cost of living we are heading towards a public health polycrisis. Increasing evidence shows greater social inequity in people having their thermal needs met.

The challenge is not just a housing issue, it is also a design, legal, biological and psychological problem. This project will co-develop a new interdisciplinary model that will address thermal injustice by combining architectural, psychological, legal, engineering and genetic knowledge for improving domestic thermal comfort.

The model will deliver new knowledge for designers and the housing sector to account for diversity of thermal need and understanding the implications of thermal injustice. It will also provide new insights for policymakers to improve housing development strategies.



Project Lead and Co-Leads:

- S.Oliveira, K.Witte, S.Vermeulen, G.McGill - University of Strathclyde
- A.Chatzimichali – University of Bath
- C.Spence – University of Oxford
- K.Carter – University of Edinburgh

Project Partner Organisations:

- Architecture & Design Scotland, Bywater, Julie Godefroy Sustainability, EURAC, Max Fordham, Public Health Scotland, Regen

A row of logos for the project partners and universities. From left to right: University of Strathclyde Glasgow, University of Bath, University of Oxford, The University of Edinburgh, Architecture & Design Scotland, terra3cube, MAX FORDHAM, and REGEN.

Historical horticulture: a quest for future plant propagation solutions

Modern horticulture faces two urgent problems: many plant species remain difficult or impossible to propagate, and sustainable peat-free media for propagation are elusive. Historical horticultural texts may hold forgotten solutions, but these records are scattered, undigitised, and linguistically complex.

Unlocking this knowledge requires an interdisciplinary approach between plant and horticulture scientists, historians, linguists, and computer scientists, collaborating to develop AI-powered image-recognition tools trained on historical terminology, enabling efficient searches of rare manuscripts.

The identified techniques will be tested in glasshouses to validate their effectiveness and potential for improving sustainable practices. While improving the propagation of species for wood products, net-zero targets and biodiversity, it will also enrich our understanding of our cultural heritage.



Project Lead and Co-Leads:

Amanda Rasmussen, Christina Lee, Andrew French, Michael Pound,
Sandra Martinez-Jarquin – *University of Nottingham*

Project Partner Organisations:

Royal Horticulture Society (RHS)

Radical novel design of a haemodialyser based on fluid mixing

Haemodialysis is the lifesaving process used for patients with kidney failure. It cleanses blood by pumping it through a machine using semi-permeable membranes to remove waste products and toxins before returning it to the body. It typically involves 3 treatments a week lasting 3 to 4 hours which considerably impacts patients' lives.

This project seeks to significantly improve the efficiency of haemodialysis using fluid engineering, scientific computation and clinical haemodialysis practices. It draws inspiration from the theories behind heat exchange and fluid mixing and will also experiment with introducing active mixing into the flow of blood and dialysate solution.

This will lead to faster cleansing of the blood, reducing costs and usage of clinical equipment, and improving patients' lives.



Project Lead and Co-Leads:

Pierre Ricco, Melika Gul, Albert Ong - University of Sheffield,
Veena Reddy – Northern General Hospital (Sheffield)



Quantum Emotions

How do we remember emotional events? The order in which we remember our emotional memories provides shape and story to our lives. Temporal ordering can enhance the detail, context, and accuracy of our memories but it is also susceptible to distortions by emotions. Little is known about the neural and behavioural processes underlying this everyday experience.

Quantum mechanics is a tool for representing scenarios where the order of events impacts the outcome but is usually associated with the study of subatomic particles. This interdisciplinary project will bring together quantum mathematics and psychology to explore how emotions effect the order and accuracy of our memories, contributing to the emerging field of Quantum Cognition.

Developing tools which can model these memory effects will allow us far greater understanding of memory, with impacts on areas such as mental health and the criminal justice system.



Project Lead and Co-Leads:

Barbara-Anne Robertson, Jonte Hance – *Newcastle University*

Project Partner Organisations:

Nagoya University, National Institutes for Quantum and Radiological Science and Technology, Ritsumeikan University, Linnaeus University, International Investigative Interviewing Research Group (IIRG)



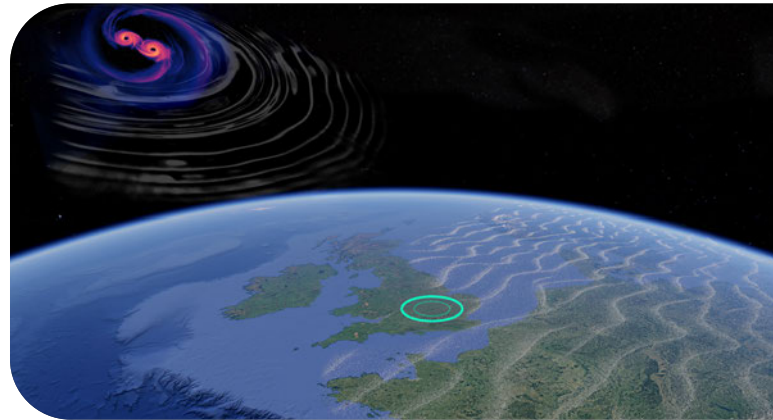
Sensing the Earth with a novel quantum-classical interferometer array

Gravitational waves will transform how we understand the universe. These ripples in spacetime originate from the most dramatic events in the cosmos, such as exploding stars, but they are very difficult to detect. Quantum sensors can measure these faint signals, but they can be masked by natural and human-made ground vibrations (seismic waves).

Conversely, natural vibrations from deep in the Earth are equally difficult to detect, even using large networks of seismometers. These signals are key to understanding the dynamics of the inner core of the planet.

This project will pair a quantum sensor with a dense network of seismometers, that will cancel out ground vibrations in real time to allow for measurement of deep Earth seismic signals and develop a method for unmasking gravitational waves in future experiments. This system will achieve far greater precision than either instrument could alone.

Bringing together physics, quantum technology and Earth science, this project will unlock a new way to explore both the cosmos and our planet, taking a major step forward in gravitational sensing and a powerful new tool for studying Earth's deep interior and environmental processes.



Project Lead and Co-Leads:

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Michael Kendall, Paula Koelemeijer, Tom Kettleby – *University of Oxford*

Project Partner Organisations:

University of Strasbourg
United States Geological Survey
University of Glasgow
STFC-Boulby Underground Laboratory



Towards recognition of animal emotion for welfare monitoring using deep affective AI models to analyse behaviour

Emotional wellbeing is central to the welfare of farm animals. However, assessing this still often relies on time-consuming human observation. This project develops automated methods to infer animal emotion (both positive and negative) from body posture and movement, enabling more objective and scalable welfare monitoring.

The challenge requires an interdisciplinary approach that brings together AI and animal behaviour and welfare to interpret species-specific behaviour and to detect complex spatiotemporal patterns in video.

The project will advance behavioural science, and deliver biologically grounded, interpretable AI technologies with the potential for adaption to multiple species. It will enable continuous, scalable emotion monitoring which will improve animal welfare and inform ethical farming practices.



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Project Lead and Co-Leads:

Melvyn Smith, Wenhao Zhang, Disi Chen, Gytis Bernotas – *University of the West of England, Bristol* Kenny Rutherford, Emma Baxter, Alistair Lawrence, Marie Haskell - *Scotland's Rural College*

Project Partner Organisations:

Agsenz Ltd, Zoetis



Wreck Assess

Globally there are thought to be more 8,500 shipwrecks from the two world wars that pose a pollution hazard, creating a potential liability that stretches into the billions of dollars. Identifying, investigating and mitigating these sites is currently costly in terms of time, money and carbon.

Wreck Assess brings together an interdisciplinary team from across academia, industry and the third sector to transform how we survey, study and understand the risks posed by these sites.

By connecting recent advances in robotics and remote sensing across ocean and earth sciences, archaeology and engineering the project will develop the lower cost, lower carbon methods urgently needed to address this complex challenge.



Project Lead and Co-Leads:

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Charlotte Thompson, Felix Pedrotti, Justin Dix, Samuel Simmons –
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Adam Sproson, Anna Lichtschlag, Catherine WardellLoic van
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Oceanography Centre*

Project Partner Organisations:

Historic England, RCHAMW, Historic Environment Scotland, DAERA,
Lloyds Register Foundation, NAS, MoD, DfT, National Maritime Museum,
ecoSUB, Ultrabeam Hydrographic

Human centred design for impact-based forecasts in East Africa

Climate change is increasing the frequency and severity of droughts and floods which are dominant problems in East Africa where many communities rely on livestock for their livelihoods. Several early warning systems provide forecasts, however, the use of these services is limited by these local pastoral communities due to the low uptake of smartphones and variation in local languages that inhibit access to the data. In addition, there is low accuracy in the data for these remote areas. We will bring together existing knowledge to meet the needs of the local users using human-centred design approaches.

Taking a crucial interdisciplinary approach, involving climate scientists, geographers, social scientists, and local pastoralists, we will co-develop usable weather-related information.

We will examine what weather-related information pastoralists need, when they need it, and how it can most usefully be communicated in ways that are appropriate for communities. This project will lead to a transformative improvement in the preparedness and resilience of pastoral communities against climate extremes, enhancing their ability to make informed decisions for the protection of livelihoods.



Project Lead and Co-Leads:

Gary Watmough, Nathan Jensen, Rowan Jackson – *University of Edinburgh*
Amanda Grossi, Diana Giraldo Mendez – *International Center for Tropical Agriculture, CIAT*
Oliver Wasonga – *University of Nairobi*



THE UNIVERSITY
of EDINBURGH



Exploring the grey zone: a biopsychosocial approach to religious delusions and conspiracy beliefs

With the increase in mental ill-health and conspiracism, there is a growing need for evidence-based research which critically rethinks what counts as a delusion and a conspiracy theory, to reduce stigma and better inform diagnostic processes.

Combining anthropology, philosophy, and psychiatry, this project will develop a novel understanding of delusional beliefs that stems from biological, psychological and sociocultural elements.

Our analysis will draw together case studies within the "grey zone", focusing on religious ideas about being divinely 'chosen' and conspiracist ideas about being nefariously 'targeted'.

Marginalised individuals and groups who hold stigmatised beliefs will be empathetically listened to using a novel interview method which hybridizes ethnographic and psychiatric approaches.



Project Lead and Co-Leads:

Joseph Webster, Paul Fletcher, Richard Holton, Emilio Fernandez-Egea –
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Fiona Macpherson – *University of Glasgow*
Nayanika Mathur – *University of Oxford*
Valerie van Mulukom – *Oxford Brookes University*

Project Partner Organisations:

Cambridge University Hospitals NHS Foundation Trust



Secure cyber physical psychological system for comprehensive assessment and rehabilitation of musculoskeletal disorders

Musculoskeletal disorders (MSDs) cause significant global disability, affecting both physical and mental health. Traditional clinical assessment is limited by motion tracking in confined laboratory settings, which often fails to capture real-life scenarios, and/or psychological state.

This project will develop a secure-cyber-physical-psychological system integrating virtual reality (VR), motion capture, eye-tracking, and psycho-physiological monitoring for personalised MSD assessment and rehabilitation.

We will use an interdisciplinary approach spanning engineering, psychology, digital-technology, and healthcare to ensure robust system design, data security, multi-modal data analysis, and clinical relevance.

The system will enable health professionals to assess both physical-psychological states across realistic VR-scenarios, improving diagnosis, rehabilitation, and treatment planning. This will lead to reduced healthcare costs, faster physical recovery and improved mental well-being, ultimately enhancing patient's quality of life.



Project Lead and Co-Leads:

Mark Williams, Arnab Palit, Carsten Maple, Derrick Watson, Melina Kunar, Toby Smith – *University of Warwick*
Stephen Cooke – *University Hospitals Coventry and Warwickshire NHS Trust*

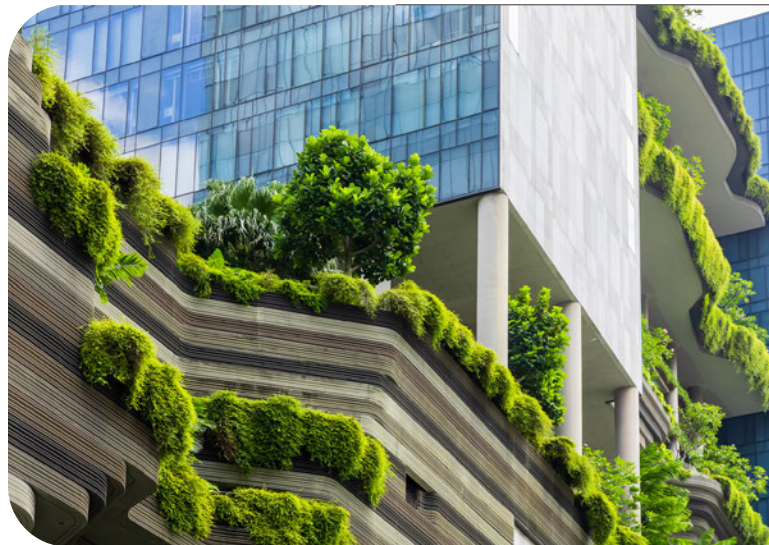
Air Spaces: getting the measure of air

Air pollution affects people unequally due to factors such as housing, geography, and occupation, and raises significant health, social, and environmental challenges. Current responses are limited by fragmented data and research siloed within separate disciplines.

Our interdisciplinary project centres how to understand air quality in all its multiple dimensions.

Drawing from atmospheric sciences, social sciences and heritage studies we will develop the new concept of air inequalities, centring people's everyday experiences of pollution in Manchester.

It will bring scientific measurements, qualitative and creative methods together with community knowledge. Working with community groups and local councils we aim to generate a shift in how policymakers conceptualise and respond to air pollution in more inclusive ways.



Project Lead and Co-Leads:

Sophie Woodward, Jenna Ashton, Andrew Balmer, Thomas Bannan, Stephen Hicks, Vladimir Jankovic – *University of Manchester*.

Project Partner Organisations:

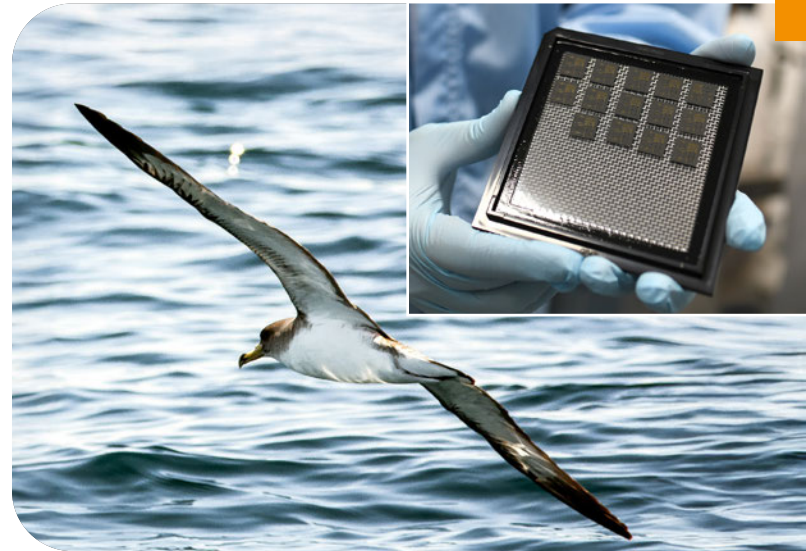
Manchester City Council; Trafford Council; Transport for Greater Manchester; Ardwick Climate Action; Love Old Trafford.

Sensing and computing taking wing: unravelling the mysteries of seabird navigation

Modern society's over-reliance on the Global Navigation Satellite System (GNSS) creates a critical vulnerability if it becomes unavailable. Nature offers a potential blueprint in seabirds, yet the specific mechanisms behind their navigation remain poorly understood due to current technology limitations.

To address this, we will apply a holistic interdisciplinary approach uniting ecologists, sensor engineers, and computer scientists. We will co-create microscale electro-mechanical sensors and in-sensor computing to attach to seabirds so we can correlate their movement with natural environmental cues.

This work aims to establish a new nature-inspired approach for robust navigation in robotics and autonomous vehicles that is free from reliance on the GNSS. It will also provide the first mechanistic models of seabird behaviour to underpin vital conservation strategies.



Project Lead and Co-Leads:

Chun Zhao, Martin Trefzer – *University of York*
Samantha Patrick, Oliver Padgett – *University of Liverpool*

Project Partner Organisations:

University of Cambridge, University of Oxford, University of the West of England, UK Microsystems Network, UK NeuMat Network



Armenian medicine: ancient sources and innovative techniques

Up until recently, political circumstances have prevented international collaboration with Armenia. In ancient times and the Middle Ages, Armenia was a key producer and exporter of pharmaceuticals, yet we know very little about the composition of these goods or the underlying medical system. There is also the folk belief that Armenian churches could cure chest infections.

Microclimates were central to premodern medicine, which were proven to influence the spread of infectious diseases and premodern medical manuscripts preserve a wealth of knowledge. It takes both sciences and humanities to unlock the pharmaceutical and non-pharmaceutical interventions described in these texts and to evaluate whether they could be used as modern-day treatments to tackle infectious diseases and antimicrobial resistance.

We will work on two manuscript collections in Armenia, comparing the content across Greek and Latin medical writings and test the efficacy of candidate medicinal herbs in a laboratory. We will also conduct microbiome analysis to evaluate the spread of pathogens and antimicrobial resistance through the air, taking late antique and medieval purification methods into account. This will lead to a paradigm shift in our understanding of premodern medicine and to new avenues for the discovery or rediscovery of pharmaceuticals and have a transformative effect on our understanding of the effects of building microclimates on public health.



Project Lead and Co-Leads:

Barbara Zipser – Royal Holloway University of London
Marie Cronier – Institut de recherche et d'histoire des textes Paris
Naira Hambarzumyan – Academy of Sciences of the Republic of Armenia
Hermine Mkrtchyan – University of West London
Iolanda Ventura – University of Bologna

Project Partner Organisations:

Mesrop Mashtots Research Institute of Ancient Manuscripts
Armenian Apostolic Holy Church Etchmiadzin





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