# Building for breakthroughs

# Contents

ARIA's mission is to unlock scientific and technological breakthroughs that benefit everyone. Our success will be measured by the lives transformed by ARIA's work.

# Transforming industries, lives + communities

# A letter from our CEO

> " We founded ARIA on the belief that the UK has the talent, expertise, institutions, and networks to turn this mission into reality. Though we're working on decadal timescales, early signs suggest that belief was well placed."
>
> Ilan Gur
> CEO

**ARIA enters its third year with the same ambition that we began with: to unlock scientific and technological breakthroughs that transform industries, lives, and communities across the UK and beyond.**

Parliament created ARIA with a belief that the UK's scientific talent, institutions, and entrepreneurial drive can translate that mission into reality. Seeing the incredible community that's grown to support our mission this year, we can confidently say that belief holds true.

A year ago our Programme Directors (PDs) defined ARIA's first opportunity spaces: areas where scientific breakthroughs can catalyse a step change in economic growth and social prosperity. Today, we are funding nearly 200 R&D Creator teams to redefine what's possible in areas ranging from synthetic biology to AI, robotics, and climate. The consequences of success in any one of these spaces are profound. Our scalable neurotech teams are developing new tools to treat neurological and psychiatric disorders that affect hundreds of millions of people worldwide, including the first clinical trial of the world's most cutting-edge braincomputer interfaces with NHS patients. Our programmable plants teams are applying cutting edge synthetic biology to engineer new traits in plants, from drought resistance to novel material production — a generational opportunity to transform global agriculture from the ground up. And the list goes on.

All told, our initial programmes have made more than £400m in funding available to the UK's R&D ecosystem over the next three to five years. In line with our mandate, this funding is supporting researchers in entirely new ways that amplify the strengths of UK Research and Innovation (UKRI) and our partners across the ecosystem. But to succeed, the researchers we fund will have to achieve more than scientific breakthroughs. They'll need those breakthroughs to spark valuable new capabilities, markets, and industries. To help with that, we launched Activation Partners — a coalition of nine pioneering organisations across science entrepreneurship, investment, and ecosystem building — to ensure that when ARIA research breakthroughs emerge, they turn into real impact. This initiative and our broader focus on science entrepreneurship are already bearing fruit. Our funding has already catalysed the creation of eight new UK startups and seven new UK subsidiaries of global firms.

Of course, when working at the edge of the possible, nothing is guaranteed from the start. Our job is to create the conditions where the boldest ideas can find their footing, then learn from the dead ends and move with conviction toward the paths that show promise. Fulfilling our mandate depends on high ambitions, and on a robust portfolio from which the world-changing outcomes can emerge. That in mind, we are thrilled to introduce ARIA's second cohort of Programme Directors: eight entrepreneurial researchers from diverse backgrounds who believe the UK is the best place in the world to realise their visions for the future. They are already activating key parts of the research community that ARIA has not yet engaged, and whose bold ambitions we will need to succeed.

Onwards.

Ilan Gur
CEO

# What we're building

# Building the conditions for breakthroughs

The transformational breakthroughs that ARIA was set up to pursue cannot happen in a vacuum. We need to build the right conditions to maximise the potential of catalytic ideas and discoveries turning into real world impact. We believe these interrelated conditions are: capabilities, communities, and capital.

Everything we do — from embedding science entrepreneurship into our model through Activation Partners to our approach to risk — is about building these out to support our programmes and activities. These conditions compound on one another, amplifying the impact of each, and create unique connections and new pathways for scientific discoveries and impact.

+ **Capabilities:** We are generating new discoveries, approaches, as well as first-of-a-kind and best-in-class demonstrations — changing the conversation around what's possible.

+ **Communities:** We are creating, connecting and building new communities of people, areas of research, and dynamic networks in the R&D landscape — both in the UK and internationally.

+ **Capital:** We are generating new flows of investment toward UK R&D ecosystem, including the development of ventures, prototypes and products.
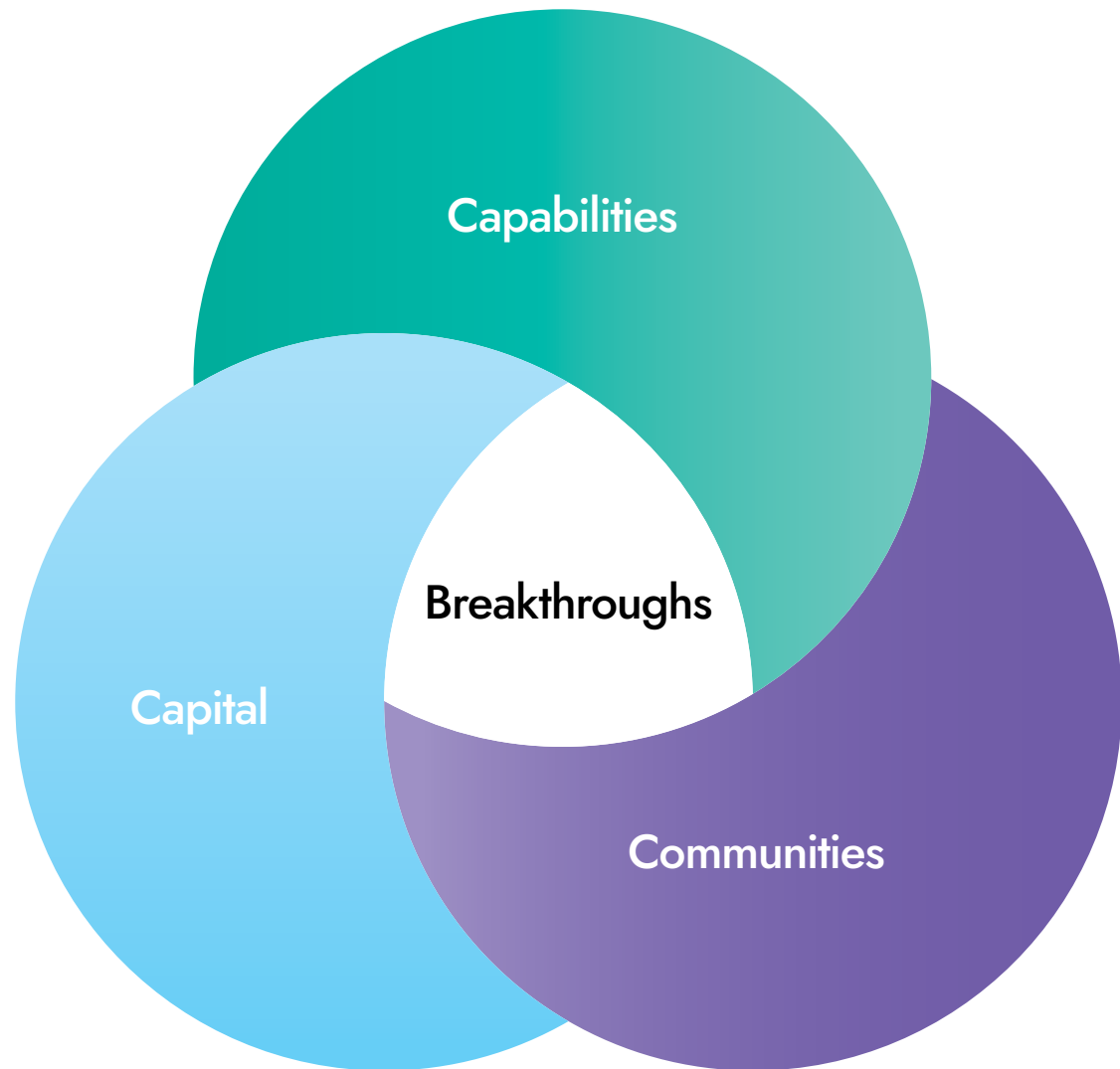
# Over the past year, ARIA has made significant progress in building each of these conditions…



**+ Capabilities**

## Changing the conversation on what's possible

The highly differentiated and transformative potential of all our programmes reinforces the UK's reputation as one of the few places in the world where breakthroughs can happen. ARIA has generated excitement and interest among other governments, keen to learn from and emulate ARIA's model. The Scaling Compute programme was highlighted as a key strategic opportunity at a preeminent AI conference (NeurIPS), in a market expected to be worth $1.8 trillion globally by 2034. Inspired by our opportunity space, XPRIZE is now fundraising for a global prize on "programmable plants".

Note: Statistics accurate as of May 2025



**+ Communities**

## Attracting world-class talent

Fundamentally, ARIA believes people drive innovation. It is crucial that we are able to attract talent, from all over the world, who are excited by our mission and want to work with us. We recruited our inaugural cohort of Programme Directors in 2023 — including leading researchers in AI, and deeptech startup founders. Our second cohort of Programme Directors joined us in April, bringing entrepreneurial expertise from synthetic biology, AI, and chemical engineering.

Working alongside our programmes are individuals and organisations on the leading edge of their fields, including Yoshua Bengio, winner of the Turing Award ("Nobel Prize of Computing"), who joined as Scientific Director of our Safeguarded AI programme, along with some of the world's most successful deeptech VC funders.



**+ Capital**

## Generating new flows of investment to the UK

Activation Partners — our flagship initiative to bolster the UK's ambition to become a global launchpad for science entrepreneurship — has already led to at least five US organisations, including two of the world's top deep-tech VC funds, establishing UK operations. These organisations are investing in the UK's R&D ecosystem, signalling the UK as a leader at the forefront of breakthrough research and technology.

More than 40% of ARIA's R&D funding to date has been allocated to startups and industry, with 7% of our initial projects catalysing the formation of new deeptech companies. One of our earliest grants helped catalyse UK AI hardware spinout Fractile and another sparked the creation of a UK subsidiary of Normal Computing, a frontier AI startup from the US.

# What we've built in numbers
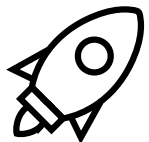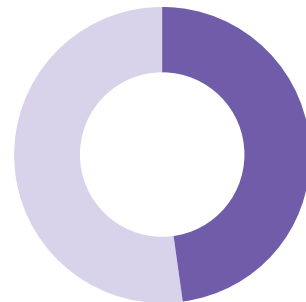
## £361m
Total amount of funding under agreement

## 7
international organisations attracted to launch UK operations

## 15
projects that have catalysed new companies and subsidiaries

## 88%
of funding awarded to UK-based teams

## 48%
Share of funding going to startups and companies

### Core team

## 64%
increase year-on-year

Our team spans
## 5 decades,
with the biggest representation of the team in the 25-29 age bracket (29%)

## ≥12%
are LGBTQIA+ (15% of employees have not disclosed)

## 9
different religions and belief systems represented

## ≥8%
have a disability

## ≥11%
are neurodiverse

## 49%
of our team are based outside of London

"Our funding terms are designed to encourage inventor-led startups and provide a stimulus for science entrepreneurship in the UK. We're seeing encouraging signs of this taking hold, with strong examples of existing companies being drawn to build in the UK, as well as a significant amount of our funding reaching the UK's startup ecosystem."

Antonia Jenkinson
Chief Financial and Operations Officer

Note: Statistics accurate as of May 2025

# Programmes

ARIA programmes are designed to advance complex, large-scale ideas that require coordinated investment and management across disciplines and institutions.

Each of these programmes sits within a unique opportunity space, critically important but underexplored areas of research that we believe are ripe for breakthroughs.

## Precision Neurotechnologies

Programme Director Jacques Carolan leads our Precision Neurotechnologies programme. Backed by £69m, this programme aims to unlock new methods to interface with the human brain at the circuit level.

This programme emerged from the opportunity space: Scalable Neural Interfaces.

## Synthetic Plants

Programme Director Angie Burnett leads our Synthetic Plants programme. Backed by £62.4m, this programme aims to catalyse a new generation of major crops that are more productive, resilient, and sustainable.

This programme emerged from the opportunity space: Programmable Plants.

# Programmes continued

## Safeguarded AI

Programme Director David 'davidad' Dalrymple leads our Safeguarded AI programme. Backed by £59m, this programme aims to develop the safety standards we need for transformational AI.

This programme emerged from the opportunity space: Mathematics for Safe AI.

## Robot Dexterity

Programme Director Jenny Read leads our Robot Dexterity programme. Backed by £57m, this programme aims to transform robotic capabilities and unlock a step change in human productivity.

This programme emerged from the opportunity space: Smarter Robot Bodies.

## Forecasting Tipping Points

Programme Directors Gemma Bale and Sarah Bohndiek co-lead our Forecasting Tipping Points programme. Backed by £81m, this programme aims to enhance our climate change response by developing an early warning system for tipping points.

This programme emerged from the opportunity space: Scoping Our Planet.

## Scaling Compute

Programme Director Suraj Bramhavar leads our Scaling Compute programme. Backed by nearly £50m, this programme looks to redefine our current computing paradigm.

This programme emerged from the opportunity space: Nature Computes Better.

## Exploring Climate Cooling

Programme Director Mark Symes leads our Exploring Climate Cooling programme. Backed by £56.8m, this programme aims to transparently explore — under rigorous oversight — whether approaches designed to delay, or avert, climate tipping points could be feasible, scalable, and safe.

This programme emerged from the opportunity space: Future Proofing our Climate and Weather.

" This is more than just a funding opportunity; it's a call to action, inviting us to dream bigger, think smarter, and work harder — together — to achieve something truly extraordinary."

Rylie Green
Imperial College London

⬡ Scalable Neural Interfaces

# Precision Neurotechnologies
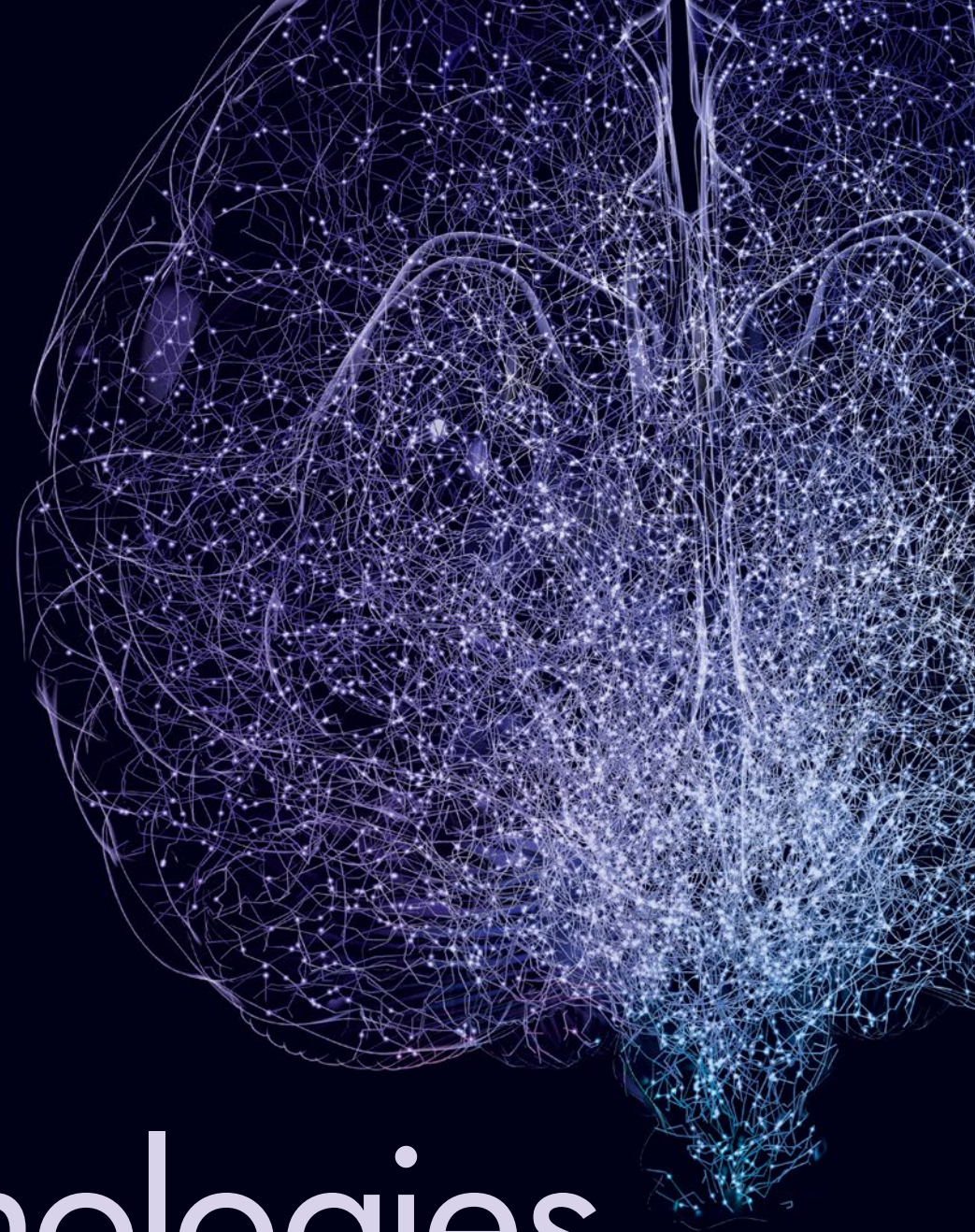
# Precision Neurotechnologies continued

## What we're solving for

Neurological and neuropsychiatric disorders have overwhelming societal and economic impacts. In the UK, one in six people[1] has at least one neurological condition, with a cost to the NHS of £4.4 billion per year[2]. These disorders go far beyond motor and speech impairments; they include Alzheimer's, epilepsy, addiction, and depression. Many of these are neural circuit-level disorders, or problems with the 'wiring' of the brain, but current technologies lack the requisite precision and most are highly invasive. The increasing prevalence of brain disorders underscores the need for greater investment into more precise, direct, and elegant approaches to interfacing with neural circuits. We need to build highly targeted, minimally invasive technologies that enable us to interface, at scale, with the human brain.

1  Neuro Numbers 2019: neural.org.uk
   /wp-content/uploads/2019/07/
   neuro-numbers-2019.pdf

2  The National Brain Appeal:
   nationalbrainappeal.org/
   why-support-us/key-facts-figures

## ⌕ SPOTLIGHT ON CREATORS

### Next-Generation Brain-Machine Interface for Whole-Brain I/O:

We are funding a team from the Barking, Havering and Redbridge University Hospitals Trust to conduct a trial in the NHS aiming to change patients' mood via ultrasound. The team are using advanced brain imaging and neuromodulation which allows for whole-brain, high-resolution imaging and precise neuromodulation. They'll measure and modulate neural activity across different mood states, enabling the development of a predictive model of affective brain states. This model will be used to simulate and optimise neuromodulation strategies aimed at shifting brain states towards clinically meaningful outcomes.

### Minimally Invasive Self-Regulating Gene Therapy for Neuropsychiatric Disorders:

We are funding a team, based at UCL, to work on reversing dysfunctional brain circuits towards a stable physiological 'ground state' that's more resilient to minor perturbations that trigger paroxysmal activity. They'll use a new generation of cell-state gene therapies to correct abnormal excitability in closed loop, aiming for lasting disease modification with minimal side effects. With clinical translation as the long-term goal, they'll use focused ultrasound to open the blood-brain barrier for minimally invasive delivery of viral vectors.

### Tissue Engineered Living Electrodes for Synaptic-Based Precision Neuromodulation:

We are funding a team from the University of Pennsylvania to develop 'living deep brain stimulation' by optogenetically engineering cells and growing them in constructs that constrain the cell bodies on top of the brain and send axonal projections deep inside it. Once implanted, these cells functionally integrate into disordered circuitry and can controllably modulate specific neurons. This will be applied to Parkinson's disease to replace coarse grain deep brain stimulation. This could also lead to a versatile platform that can support the implantation of other cell types that could facilitate the release of other neurotransmitters, ultimately leading to treatments for a wide range of conditions.

"ARIA's willingness to take risks and explore the unknown is what enables this programme to pursue what is considered nearly impossible. We're excited to be part of a community with a clear vision, and the courage to take bold steps to make it a reality."

Daniel Dunkelmann
Max Planck Institute of Molecular Plant Physiology

⬡ Programmable Plants

# Synthetic Plants

# Synthetic Plants continued

## What we're solving for

Today's agricultural system is facing a critical moment. Low genetic gains in our major crops coupled with environmental degradation are already impacting global food security, compounded by an unpredictably changing climate. Representing 80% of the world's biomass, plants are a critical lever for addressing these interconnected challenges, but to unlock their potential, we must accelerate the pace of agricultural innovation.

Synthetic biology is already revolutionising the world of healthcare with novel approaches to drug production, CRISPR therapeutic treatments and the advent of personalised genomics. Exploring synthetic biology applications to tailor the traits of plants has the potential to transform the agricultural industry, and deliver valuable benefits ranging from food to pharmaceuticals and beyond.

We've built a programme that unites social scientists, synthetic biologists, and plant biologists to catalyse the emerging field of plant synthetic genomics. Among the projects, we could potentially see the world's first synthetic chromosome, a new potato variety, and sustainable, low-cost, and accessible production of biopolymers and biopharmaceuticals. Success in this programme would transform the £3 trillion global agriculture sector and position the UK at the vanguard of a new bioeconomy.

## 🔍 SPOTLIGHT ON CREATORS

### From Prototype to Production: Implementing Synthetic Chromosome Technology in Crops:

We are funding a team led by Cambridge University to address the challenge of influencing plant chromosomes, structures that contain genetic 'instructions' that determine plant traits, such as growth patterns, stress tolerance and soil nutrient uptake, that are critical for improving food security and climate resilience. The team seeks to tackle this challenge by laying the foundations for delivering large and complex sets of chromosomes into crop plants. Their goal is to build and deliver a large piece of DNA, approximately the size of a million genetic 'letters', into the potato, as a synthetic plant chromosome.

### Cultivating Responsible Innovation for Plant Synthetic Genomics through Experimental Governance:

We are funding a team led by The University of Edinburgh to explore the social, ethical, and ecological dimensions of novel technologies in synthetic plant genomics by engaging farmers, growers, plant biologists, and the wider public. They'll generate discussion using commissioned artistic works, such as a short documentary, photography series, and biological art installation, and will host public events across the UK. Closely integrated with this programme's technical projects, the team aims to equip the next generation of researchers with the skills and connections to think in new ways about why advanced genetic work in plants is worth doing, who might benefit from it, and who should be making decisions about it.

### SyncSol: A Streamlined Platform for Synthetic Chloroplast Genome Assembly in Solanaceous Crops:

We are funding researchers led by the Max Planck Institute of Molecular Plant Physiology to improve the safety and efficiency of genetic engineering in plants, as well as the speed at which new traits can be tested. To achieve this, they'll create a system to efficiently design, build, deliver, and assemble universal sets of chloroplast genomes — the genetic 'instructions' in the parts of plant cells that capture sunlight for energy production — in a host plant. This system will be accompanied by methods for these genomes to be introduced into a variety of major crop plants, starting with the potato. This team aims to develop solutions for the global food system by transforming the speed and scale of plant genomic engineering, and ultimately using plants as a sustainable way to make useful products.

◯ **Mathematics for Safe AI**

# Safeguarded AI

> " The exciting thing about the ARIA programme is it brings together domain-focused experts to work with theoretical teams in a really unique way."

**Thomas Morstyn**
University of Oxford

# Safeguarded AI continued

## What we're solving for

As AI becomes more capable, it has the potential to power scientific breakthroughs, enhance global prosperity, and safeguard humanity from disasters. But only if it's deployed wisely. Leveraging the raw potential of advanced AI, while maintaining acceptable safety standards, is shaping up to be one of the defining challenges of the twenty-first century. Success would be transformational for society — AI with strong safety guarantees could unlock transformative improvements in critical infrastructure, such as managing electrical grids to maximise renewable energy integration while preventing potential system failures, or enabling more responsible and efficient clinical trials for developing innovative medical treatments. It could also dramatically improve our ability to handle major disruptions like pandemics, supply chain crises, and cyber threats.

## ⌕ SPOTLIGHT ON CREATORS

### SAILS: Safeguarded AI for Logistics and Supply chain management:

We are funding HASH, an AI startup, to develop solutions which make critical pharmaceutical supply chains more resilient and efficient through the use of AI. Their research focuses on areas of the plant-to-patient pipeline where AI can speed up decision making, minimise waste, and better anticipate and respond to disruption, without compromising the safety or sustainability of the supply chain.

### Safeguarded AI-Enabled Biopharmaceutical Manufacturing:

We are funding this joint project between the University of Birmingham and AstraZeneca to develop a structured and reliable framework for the mathematical modelling of biopharmaceutical manufacturing processes. Their approach will incorporate formal guarantees of compliance with the industry's rigorous safety and quality regulations to enable adoption across the pharmaceutical production process, accelerating drug discovery, and production, while significantly reducing cost.

### True Categorical Programming for Composable Systems Total:

We're funding the Glasgow Lab for AI Verification (GLAIVe) to develop a type theory for categorical programming that enables encoding of key mathematical structures not currently supported by existing languages. These structures include functors, universal properties, Kan extensions, lax (co)limits, and Grothendieck constructions. Jade and team are aiming to create a type theory that accurately translates categorical concepts into code without compromise, and then deploy this framework to develop critical theorems related to the mathematical foundations of Safeguarded AI. They have built their lab in Glasgow.
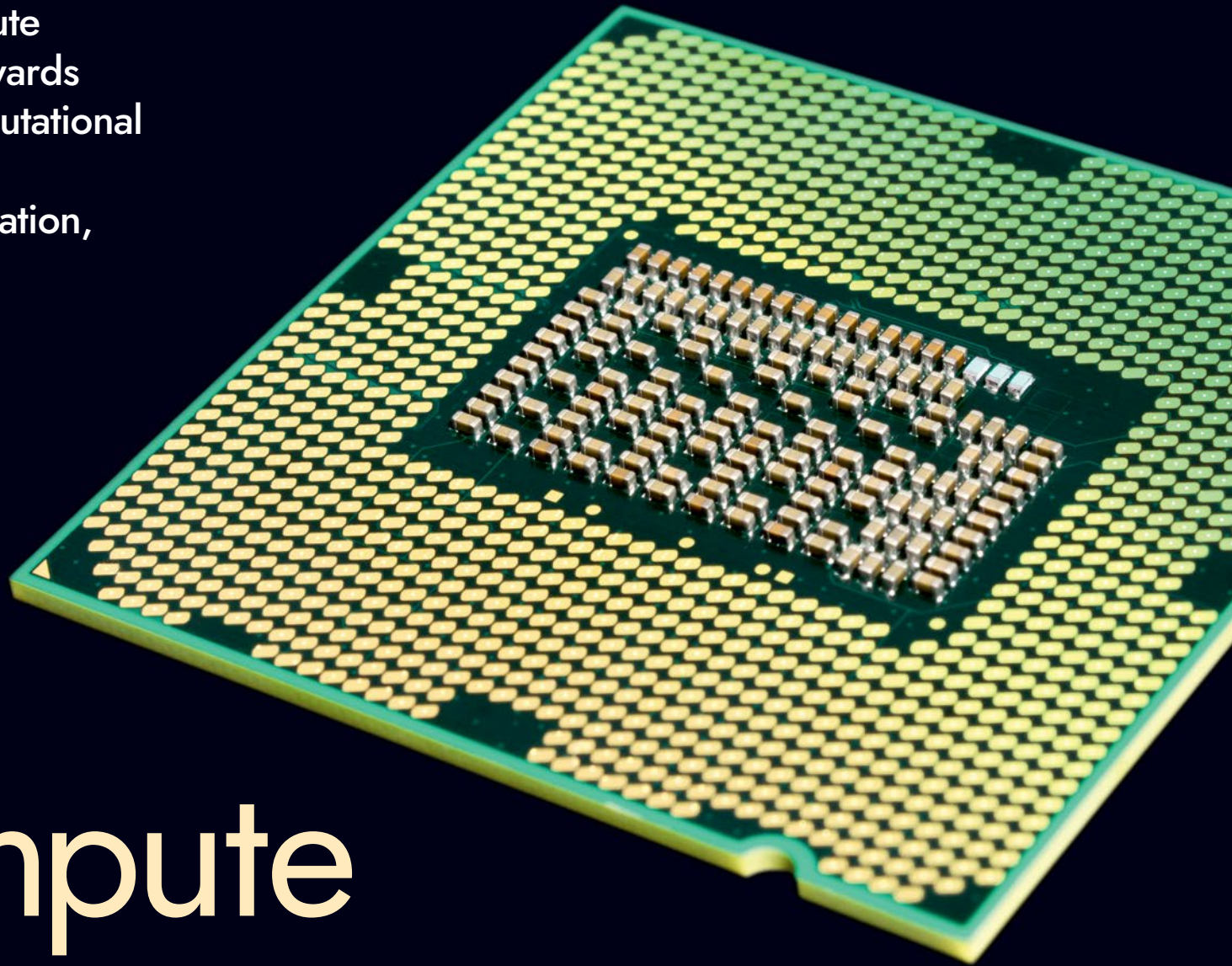
" Through ARIA's Scaling Compute programme, we're pushing towards the fundamental limits of computational efficiency by allowing physical dynamics, like thermal equilibration, to do computations for us."

Patrick Coles
Normal Computing

⬡ Nature Computes Better

# Scaling Compute

# Scaling Compute continued

## What we're solving for

The digital electronics industry that has transformed our lives in immeasurable ways is defined by a simple fact: for 60+ years, we have benefited from exponentially more computing power, at lower cost. For the first time in history, increased performance demands greater costs, and this has coincided with an explosion in demand for more compute, driven by AI. Our current mechanisms for training AI systems utilise a narrow set of algorithms and hardware building blocks, which require significant capital to develop and produce. There are far-reaching economic and societal implications for this mismatch in supply and demand. By contrast, natural processing systems innately process complex information more efficiently — on several orders of magnitude. Through this coordinated R&D effort, we're looking to uncover new technological pathways that can bridge the gap.



## Q SPOTLIGHT ON CREATORS

### Breaking Down the Compute Graph Step by Step:

We are funding researchers at Edinburgh University and Imperial to create software tools that will provide the first widely available map of performance bottlenecks at scale. It will become an essential tool for designing future hardware systems, and will allow the AI hardware community to keep up with the breakneck pace of AI algorithms research. This collaboration brings together some of the UK's leading experts in machine learning and algorithms, computing systems and AI hardware to allow us to tackle this challenge from every angle. We can effectively explore what would happen if we went right back to the drawing board and redesigned the computing paradigm the model is based on, as well as investigate the impact of small changes like switching GPU architectures.



### Glass, Scaling AI Systems:

We are funding a team at Oxford University to rethink how AI training systems are built. Its main goal is to solve the communication bottleneck in AI training by introducing a new open interconnect. The project involves redesigning system architecture at multiple levels, including work in photonics, networking, computer architecture, memory systems, hardware/software co-design, power delivery, thermal design, and distributed systems. It will use optical interconnects through glass to connect accelerators, removing communication issues. Placing all accelerators in one server will lead to re-evaluating system aspects like memory hierarchy, its management, and how to prevent, detect, and recover from failures. This is expected to change AI research by providing compute resources at a lower cost.

### Thermodynamic Matrix Inversion:

We're funding AI startup Normal Computing to leverage their specialised knowledge in noise-based computing and the principles of thermodynamics in chip design. They will build physics-based computing chips designed to efficiently invert matrices. They will also explore the applications of this technology in training large-scale AI models, with a significant target of achieving approximately 1,000x energy savings compared to current GPU-based approaches, ultimately seeking to bring about a paradigm shift in the efficiency and sustainability of AI hardware.
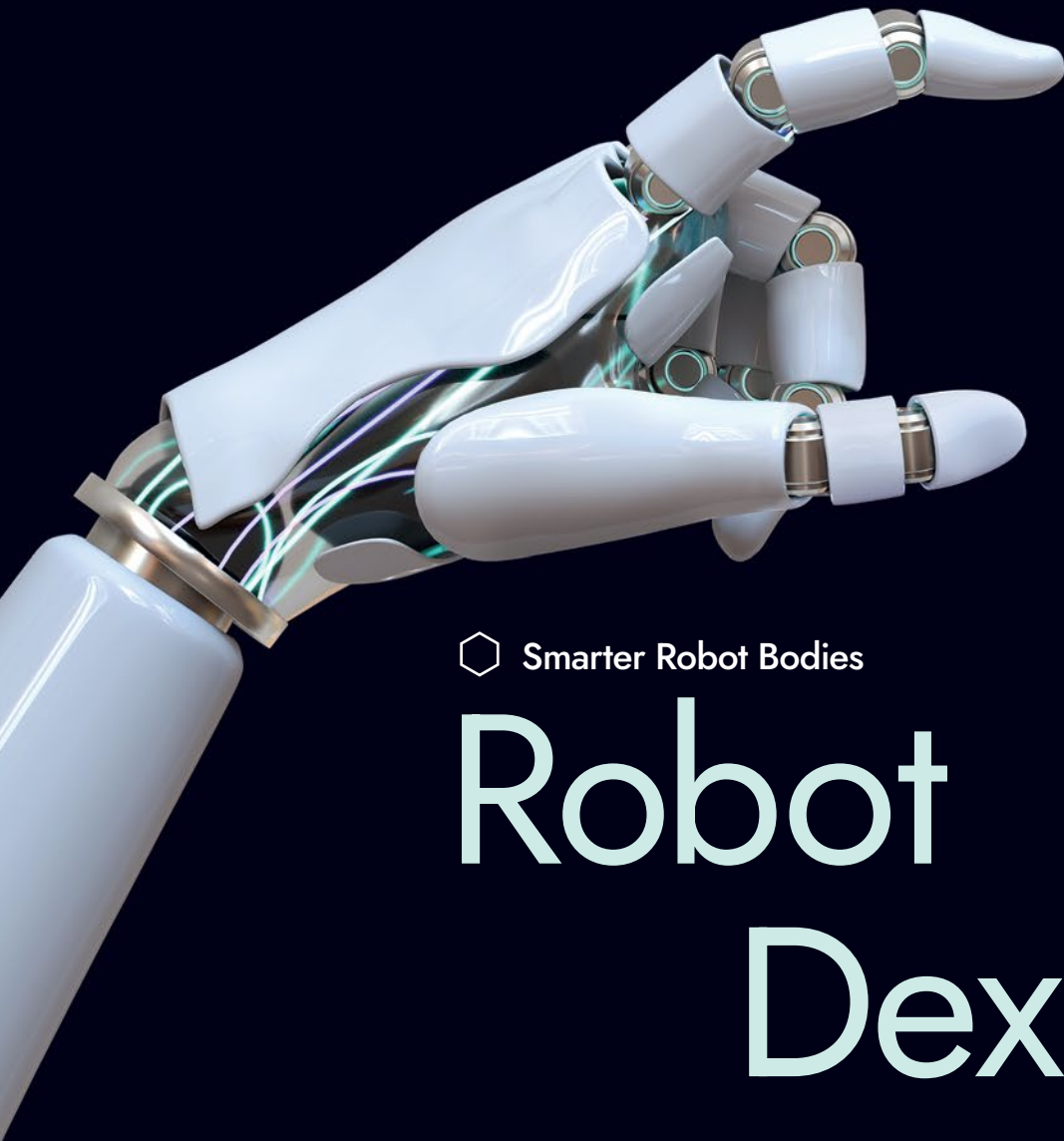
○ Smarter Robot Bodies

# Robot Dexterity

"This programme fills a long-overlooked gap, focusing on enhancing robotic dexterity through innovative hardware solutions. We are inspired by the collaborative framework, which brings together diverse Creators to co-design next-generation actuators, hands, and robotic systems. For Sangtera, this presents a transformative opportunity to contribute to, and learn from, a pioneering ecosystem dedicated to reshaping the future of robotics."

Tairan Wang
Sangtera Inc

# Robot Dexterity continued

## What we're solving for

With the proportion of the world's population aged 65+ set to triple by 2100, labour shortages for physically demanding work are set to increase. But compared to staggering advances in computation, the development of robot bodies has stalled in recent decades. Today, robots remain incapable of helping us with many of the difficult or dangerous tasks where we need them most.

This programme aims to stimulate innovation in robotics hardware and harness advances in AI and simulation techniques to transform robotic dexterity. By funding different advances and approaches in hardware, combining novel components with a new approach to design, we will release the bottlenecks in robotic dexterity and create vastly more capable and useful machines. We'll aim to demonstrate the power of this approach by producing one or more robotic manipulators with unprecedented dexterity on a real-world task.

## 🔍 SPOTLIGHT ON CREATORS

### GRIT!:

We are funding TouchLab, a Scottish startup that develops tactile sensors based on piezoresistive/capacitive quantum tunnelling inks, to develop their next-generation product. At the moment, Touchlab manufactures a sensitive fingertip which enables robots to sense what they are touching. They now want to extend this to a new generation of sensors with higher resolution, better electronics to read out the information, and triaxial sensing. Crucially, these new sensors will link together to form a skin that can cover the entire surface of robot manipulators. This kind of sensitivity will be pivotal for robot manipulation, and Touchlab is one of the leaders in this growing field.

### Sangtera Joint Actuator:

We're funding Sangtera, a US startup, to develop microhydraulic actuators based on electrowetting as an efficient alternative to conventional electric motors. Their approach uses electrodes to manipulate surface tension in such a way as to move one surface over another, producing either linear or rotary motion as required. The big advantage is that these microhydraulic actuators experience no loss of efficiency with miniaturisation. These actuators will be made small enough to be placed directly in the tiny joints of robot fingers, opening up an entirely new design approach. Small, highly efficient motors have potential applications well beyond robotics, for example in precision manufacturing and instrumentation, medical devices and surgery, and wearables.

### UPWARD and OGRES:

We are funding Shadow Robot, a UK SME with 25+ years of experience in designing and building complex robotic hand hardware to lead two projects. UPWARD addresses the challenge of power distribution in robotic hands. Shadow Robot is working to develop methods to make all the joints of the robot hand move without compromising the hand form factor with too many actuators. This project has the opportunity to significantly change the way we think about robot dexterity and the construction of robot hands. Working with Northwestern University and Texas A&M, with support from the UK's Manufacturing Technology Centre, Shadow Robot will explore new methods of power distribution to develop new robot hands unlocking the next steps in robot dexterity. The vision of the second project, OGRES, is to use the power of generative AI to revolutionise robot design. Shadow will work with experts in academia, startups and non-profits to develop a toolchain that allows robotic engineers to rapidly produce and test hand prototypes to accomplish a required set of tasks and move to robust, manufactured hands with integrated electronics, sensing and actuation.

Future Proofing Our Climate and Weather

# Exploring Climate Cooling

"The value of research to wider society in this space is enormous. The greatest value will be achieved with inclusive research programmes and where guardrails and limits on the particular research are arrived at with input from all constituencies, and especially those who are most affected by the effects of climate change and least able to adapt — and ARIA is seeking to ensure a wide range of voices and opinions are involved in guiding the programme."

Dr Shaun Fitzgerald
Centre for Climate Repair

# Exploring Climate Cooling continued

## What we're solving for

Rising global temperatures increase the likelihood of crossing climate tipping points — abrupt and potentially irreversible shifts in the Earth's climate system. While decarbonisation is the only sustainable way to reduce the risk of these events, our current warming trajectory makes a number of these tipping points possible over the next century. This has led to a growing international interest in approaches to actively reduce global temperatures in the short term; however, we currently have limited understanding of whether such interventions are scientifically feasible, and what their full range of impacts might be.

This programme looks to leverage the UK's trusted leadership in climate science by funding teams to gather the critical missing scientific data, building the evidence base needed to make wiser, better-informed decisions about the future. United by a commitment to conducting research transparently and responsibly, and scrutinised by an independent Oversight Committee composed of international experts, these projects aim to navigate the complex ethical dimensions and establish best practices within this field.
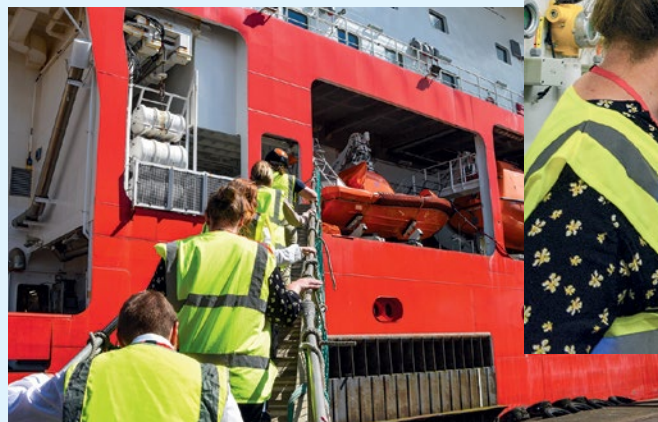
## 🔍 SPOTLIGHT ON CREATORS

### Re-thickening Arctic Sea Ice:

We are funding a team from the Centre for Climate Repair at the University of Cambridge to investigate the feasibility and efficacy of ice thickening as a method to reduce the rate of arctic sea ice loss. Researchers will conduct controlled, small-scale experiments in Canada across three winter seasons (2025-26 to 2027-28). The process involves pumping seawater from beneath existing ice and spreading it on top, where the frigid air freezes it quickly, creating thicker ice patches. These experiments will be conducted in close collaboration with local communities and under ARIA's stringent governance framework, prioritising safety and environmental monitoring. The goal is to gather essential real-world data to rigorously assess if this intervention warrants further consideration.



### PULSE Project:

We are funding a team from the University of the Philippines Los Baños to work on research relating to the ethics and public perception of solar radiation management in the Global South. Communities in the Philippines living near volcanoes possess invaluable, real-world experience with atmospheric changes that share similar atmospheric processes to potential climate interventions like stratospheric aerosol injection (SAI). Gathering these insights is crucial for grounding abstract global discussions about SAI in lived reality, and ensuring that the voices of those most vulnerable to both climate change and potential interventions are central to the conversation. This work will help develop ethical, inclusive governance frameworks and foster informed climate leadership in the most affected regions.

### Ecological Impact Assessment of Earth Cooling Experiments in the Arctic (Eco-ICE):

We are funding a team from the British Antarctic Survey to provide an independent impact assessment of potential climate interventions in the Arctic marine environment. Fragile polar ecosystems are critical to the global climate system, yet the potential ecological consequences of climate interventions at the poles are poorly understood. This independent assessment by experts in modelling and ecology is critical to provide a thorough and balanced evaluation of potential climate interventions in the Arctic. The project will provide best-practice guidance for the ecological risk assessment of future proposed interventions within the polar marine environment.

" This programme offers the opportunity
of monitoring the climate in areas
of high importance to understanding
the climate — both scientifically
and commercially — where there
is no in-situ monitoring done today."

Anders Læsøe
ASIAQ
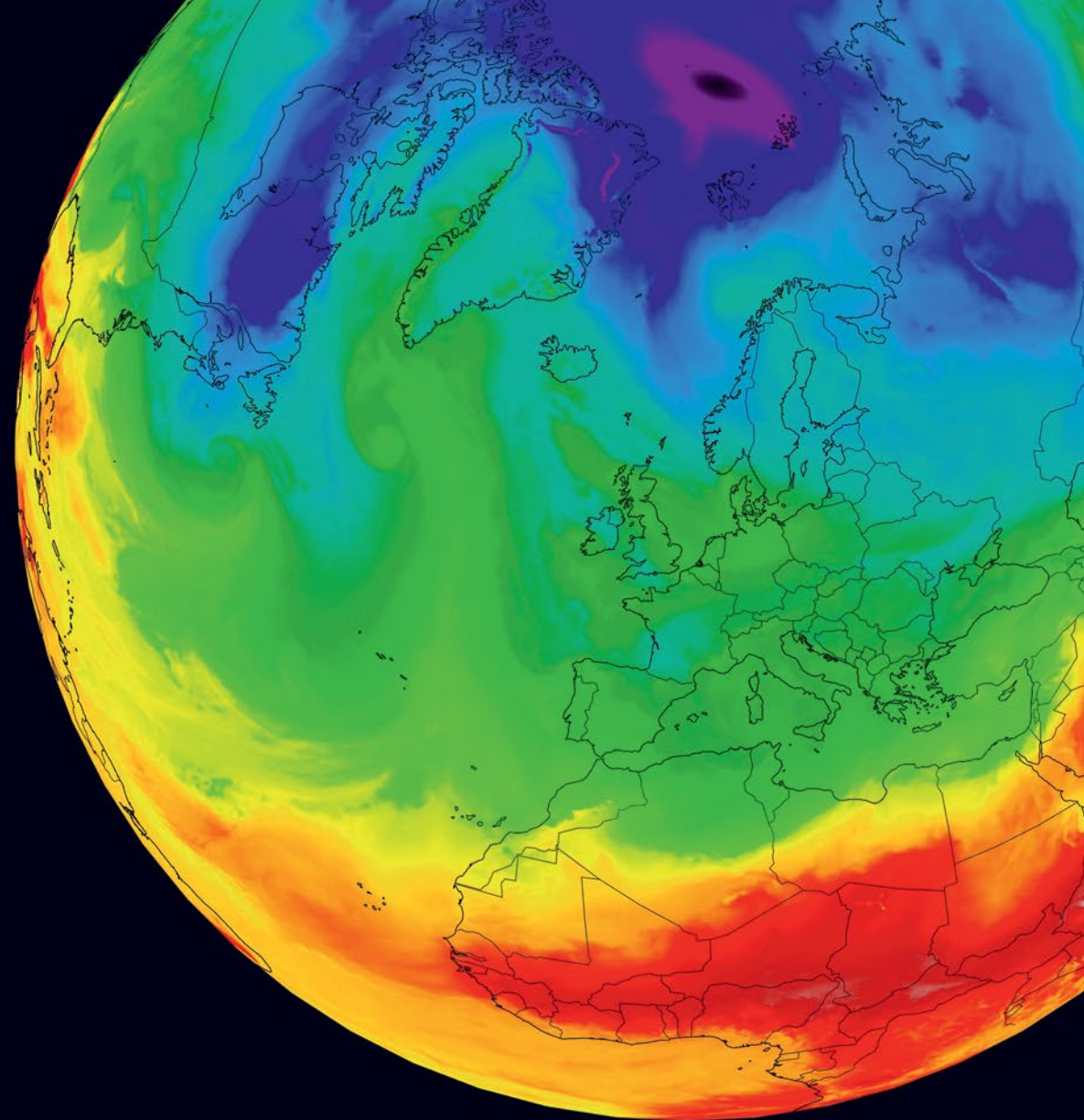
⬡ Scoping Our Planet

# Forecasting Tipping Points

# Forecasting Tipping Points continued

## What we're solving for

Major parts of the Earth system are at risk of crossing climate tipping points within the next century, which could lead to devastating consequences — potentially exposing half a billion people to annual flooding events, and triggering severe repercussions for our biodiversity, food security, agriculture, and more. Without early warning, we're incapable of implementing mitigation or adaptation measures in the timescales required.

Our best observational datasets are mostly still in nascent stages of development and our best climate models are computationally expensive and often do not include all the physical processes that are needed. Tackling these challenges is crucial to confidently predict when a system will tip, what the consequences will look like, and over what timescales they will unfold. This programme recognises that creating an early warning system requires a holistic approach, and unites international multidisciplinary teams, breaking down existing research silos, to operate across land, air and sea.

## ⌕ SPOTLIGHT ON CREATORS

### OTTER:

We are funding a team from Durham University to develop a new instrument, OTTER (Optical Turbulence for Tracing Energy in the atmosphere), which will employ a low SWaP-C drone-based laser transmitter and ground-based receiver unit, to measure path-resolved properties of turbulence in the atmospheric boundary layer. This turbulence is associated with surface-to-atmosphere heat fluxes that are crucial to the accurate modelling of ice sheet melt rates and subsurface ocean currents. Using OTTER, the team will look to unlock a step-change in our understanding of this turbulent environment, and greatly improve both the quality and quantity of data available to model climate tipping points.

### GRAIL:

We are funding a team, led by the British Antarctic Survey, to capture the complex physical processes at difficult-to-access ice faces and floating ice shelves by: developing new sensors and ocean/ice/airborne platforms; deploying these in east and north west Greenland fjords; and implementing improved physics in the UK's Earth System Model. Their results will be scaled up to other fjords, then input into a prototype early warning system, which will be co-designed with Greenlandic stakeholders.

### TUNU:

We are funding a team at the ASIAQ Greenland Survey to deploy new climate monitoring stations in the largely inaccessible eastern coast of Greenland. This will provide essential first-of-its-kind in situ climate data from the borderline between the Greenlandic ice cap and the subpolar gyre.

# Activation Partners
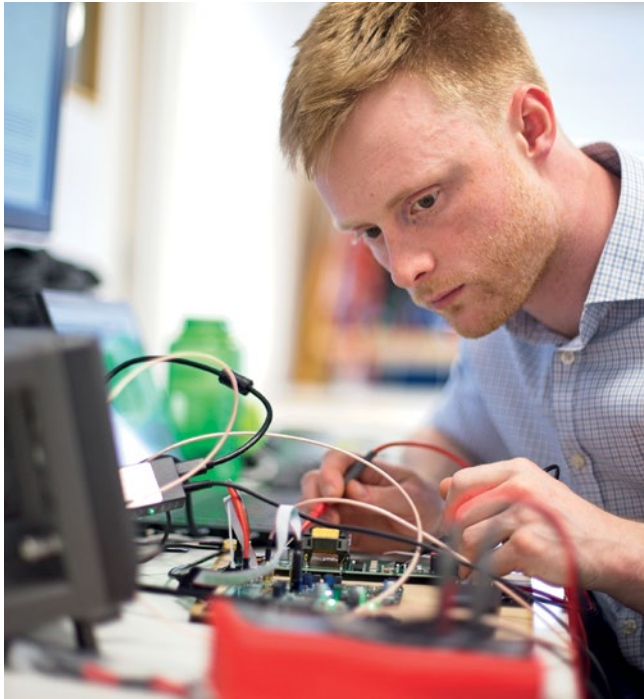


**To fulfill our mission, we need to ensure breakthroughs from our programmes translate into real-world, economic value and strategic advantage for the UK. Our Activation Partners initiative was designed to create the conditions in our opportunity spaces such that when breakthroughs emerge, they have the greatest chance of translating into value.**

Made up of nine deeply technical and highly entrepreneurial organisations, our partners are pioneers of new science innovation models, community builders, world-leading research labs, and deep-tech focused accelerators — all united in their commitment to propel early-stage R&D into game-changing innovations that will shape the world. Some of our partners are already established players in the UK, while others are setting up operations here for the first time. Together, they will help embed science entrepreneurship across our work, creating new scientific talent pipelines, nucleating new communities, fostering novel IP, and facilitating more investments within the UK R&D ecosystem.

These early partnerships are already creating network effects and amplifying the impact of our programmes, and will help us deepen our technical expertise and expand our reach and potential application.

Our partners 50 Years, CIC Venture Café, and Pillar VC are establishing UK entities for the first time, bringing global expertise and investment into the heart of the UK's R&D ecosystem. We're also working to co-create, launch, and scale new innovations; ARIA's partnership with Cambridge Neuroworks is bringing together scientists, clinicians, and entrepreneurs to translate speculative scientific breakthroughs in neurotechnology into practical applications.

> " We're actively thinking about how we can best harness entrepreneurial drive to turn breakthroughs from our programmes into tangible impact for the UK, and are exploring mechanisms for what that looks like in practice."

**Pippy James**
Chief Product Officer

# ARIA Activation Partner: Amodo Design

Amodo Design is a Sheffield-based startup that provides specialised engineering services to ARIA Creators. This partnership aims to accelerate the translation of high-risk, high-reward research into tangible outcomes.

## Opportunity space bottleneck:

Academia is often not well suited to rapid prototyping and product design. This impedes the translation and commercialisation of high-impact research.

## Areas of focus

- **Rapid prototyping and hardware development:** Addressing critical engineering bottlenecks faced by ARIA Creators.
- **Provide systems engineering expertise:** Integrating engineering principles into ARIA's research programmes, ensuring projects are developed with a focus on practical application and scalability.

- **Facilitate knowledge transfer and capacity building:** Establishing technical support groups to cultivate a strong UK-based engineering talent pipeline, crucial for long-term scientific advancement.
- **Community engagement:** Amodo builds communities around the engineering services they provide to better demonstrate the value of engineering to scientific research.

This strategic partnership underscores our commitment to fostering a dynamic innovation ecosystem, where cutting-edge scientific ideas are rapidly transformed into real-world solutions.

> " This partnership addresses a key gap we've identified in the UK's R&D ecosystem: the need for stronger collaboration between design engineers and scientists."

**Tom Milton**
Amodo Design, Co-Founder



## Activation Partner milestones, outcomes, and progress

| Desired outcomes for ARIA (3 years) | Progress to date |
|---|---|
| Facilitate the commercialisation of ARIA's R&D by enabling research to get to proof-of-concept and beyond. | Completed 1x project for Nature Computes Better. Currently working on 4x projects across Scalable Neural Interfaces and Smarter Robot Bodies. |
| Enable commercialisable research funded by ARIA to stay in the UK for longer through use of a UK firm. | In discussions with additional Creators across further opportunity spaces. |
| Across all our spaces, Amodo's work should debottleneck Creators who are held up by hardware or engineering constraints. They should also enable Creators to complete milestones quicker. | Strong positive feedback from Creators and PDs with evidence of accelerating ARIA projects. |
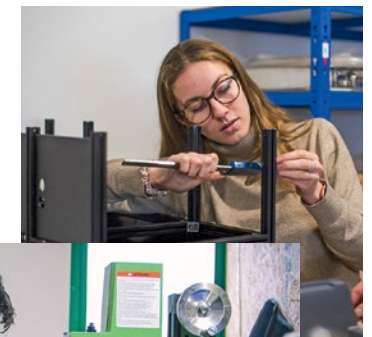
# ARIA's Activation Partners

## Convergent Research

Convergent Research is identifying and developing one to two focused research organisations (FROs) — a new scientific institutional model designed to make fast progress by using team science and systems engineering to tackle research bottlenecks — in our opportunity spaces.

**Opportunity space bottleneck:** Multidisciplinary, engineering-heavy research bottlenecks don't have a natural home. Convergent founded FROs to address this and are the world leaders in the model.

**Desired outcomes:** Creation of new organisations in ARIA's research areas to address technical bottlenecks that do not have the right institutions, i.e. academia, industry or startups aren't suitable.

## Cambridge University Health Partners

Cambridge University Health Partners is bringing together leaders from science, health and business organisations to support our Scalable Neural Interfaces opportunity space.

**Opportunity space bottleneck:** A robust UK translational ecosystem for neurotechnologies is lacking.

**Desired outcomes:** Accelerate the development and translation of scalable neural interface technologies into impactful applications by fostering research, de-risking ventures, building a funding ecosystem, and cultivating talent in this field.

## Renaissance Philanthropy

Renaissance Philanthropy is launching a new UK Horizons Programme to supercharge the UK's R&D ecosystem. The new programme will build communities, programmes, and efforts that will act as force multipliers for our opportunity spaces.

**Opportunity space bottleneck:** ARIA's projects will require diverse funding sources for their longevity. Philanthropy is a powerful R&D innovation driver but not yet at a sufficient scale in the UK.

**Desired outcomes:** Develop a high-quality talent pipeline with a "Creator mindset" for ARIA's opportunity spaces, fostering a robust ecosystem for programme success and attracting increased philanthropic investment in translational R&D.

## Google DeepMind

Google DeepMind is working with us in a non-funded partnership to identify projects designed to accelerate the impact of ARIA-backed research.

**Opportunity space bottleneck:** AI can unlock research across our opportunity spaces. Early access to frontier models can position ARIA's programmes at the frontier of their fields.

**Desired outcomes:** Build ARIA's exposure to top tier AI communities, talent, and ideas by leveraging DeepMind's background and standing in the ecosystem. Accelerate programmes through early access to frontier AI-for-science models developed by DeepMind.

# ARIA's Activation Partners continued

### Venture Café Global Institute

Venture Café Global Institute is launching their global network of innovation communities, Venture Café, in multiple cities across the UK.

**Opportunity space bottleneck:** ARIA's opportunity spaces need strongly connected communities of talent and ideas, with spaces and opportunities for collisions and collaborations.

**Desired outcomes:** Establish a central platform for ARIA and its partners to connect with the wider ecosystem, facilitating open collaboration, talent and idea sourcing, research translation support, and increased access to science entrepreneurship opportunities across the UK.

### Nucleate UK

Nucleate UK is partnering with ARIA to accelerate the development of new technologies and communities in the eco and biotech fields, supporting top UK scientific talent through targeted programmes to translate R&D into societal impact.

**Opportunity space bottleneck:** Entrepreneurship as a route to translation is underdeveloped in the Programmable Plants opportunity space. Nucleate has developed the biotech ecosystem in the UK especially amongst early career scientists.

**Desired outcomes:** Bring early career, ambitious entrepreneurial scientific talent and ideas into ARIA and its opportunity spaces.

### Pillar VC

Pillar VC has launched a fellowship programme placing top AI researchers in leading UK science labs, covering topics across neuroscience, robotics, climate science, and more.

**Opportunity space bottleneck:** Research in opportunity spaces could be accelerated by AI, e.g. genomics, neurotech and robotics.

**Desired outcomes:** Accelerate research in ARIA's opportunity spaces by connecting AI talent with UK labs, fostering venture creation from AI R&D, and attracting and retaining AI expertise within the UK.

# ARIA Activation Partner: Fifty Years

🔍 SPOTLIGHT ON ACTIVATION PARTNERS

Fifty Years is delivering its company creation programme 5050 in the UK to equip scientists and engineers with the necessary skills to start and build world-changing companies.

**Opportunity space bottleneck:**

Scientists are not trained to commercialise technologies. This is essential to reach impact from the R&D we fund. For ARIA opportunity spaces to be successful, we need startups focused on these areas to be adequately supported to reach outsized impact.

**Areas of focus**

- Fifty Years will deliver its 5050 company creation programme in the UK across our opportunity spaces, running two cohorts per year to help great scientists and engineers become great founders.

- 5050 equips scientists and engineers with the necessary skills to start and build world-changing companies that can solve humanity's greatest challenges.

- 5050 participants will identify civilization-scale problems to tackle, develop essential entrepreneurship skills, and learn everything they need to commercialise their research.

This strategic partnership underscores our commitment to fostering a dynamic innovation ecosystem, where cutting-edge scientific ideas are rapidly transformed into real-world solutions.

> " In partnership with ARIA, 5050 will help the UK's world-class scientists and engineers become world-class entrepreneurs, so that the next wave of UK invention is commercialised in Britain."

**Seth Bannon**
Founding Partner, Fifty Years

## Activation Partner milestones, outcomes, and progress

| Desired outcomes for ARIA (3 years) | Progress to date |
|---|---|
| Enable top scientists and engineers in ARIA's opportunity spaces who might otherwise never translate their research into real-world solutions to pursue entrepreneurship. | ~50 participants have been selected for the first UK 5050 cohort. |
| At least 60% of participants should be in ARIA's spaces. We have left up to 40% open to: i) shape future spaces and ii) bring technologies into our spaces from fields that may not seem immediately relevant but could create breakthroughs. | Received 30% more applications for the UK than the US cohort. |

# What we're learning

Launching seven different programmes in the space of just over a year, means we've had to move at pace and experiment along the way.

# Three key learnings from our first year



In the lead-up to our second cohort of Programme Directors, we reflected on what worked, what didn't, and what we needed to be more intentional about. Based on what we're learning, here are three things we have either initiated or put into practice this year:

1. How we approach the diversity of who we fund;

2. How we embed ethics and social responsibility throughout our programme lifecycle; and

3. How we design for active programme management.

We intend to iterate and learn in this way, alongside every cohort, knowing that pursuing breakthroughs means always being prepared to do things differently.

# 1. Driving Creator diversity

Our mission is to catalyse breakthroughs in science and technology that benefit everyone. Diversity in who and where we fund is essential to maximising our chances of achieving this. As a funder in science and technology, the magnitude and complexity of the diversity challenge is not lost on us.

We are committed to exploring ways to improve the diversity of who we support and work with, by using the levers we have as a funder. The diversity of our funded projects, to date, leaves room for improvement.

We're aiming for better, and focusing our efforts right at the start of our funding journey to significantly improve the diversity of the interactions our Programme Directors have during their discovery process. Discovery is when we proactively go out into R&D communities, far and wide, to share ideas and solicit collaboration and feedback. Crucially, it's where many of the leads for potential applicants to our funding calls come from.

For our second cohort of programmes, we have set diversity metrics based on gender and geography, to drive a more diverse discovery process. We will evaluate our approach and benchmark our outcomes with other funders in our space. We will also proactively seek and share learnings with our peers, knowing that we are not alone in our commitment to finding ways to address this sector-wide and dynamic challenge.
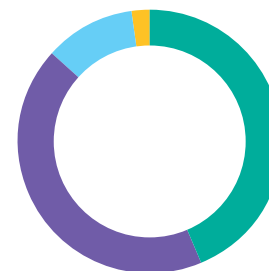
## Who we've funded, to date, by geography
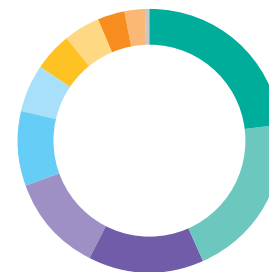
| | | |
|---|---|---|
| ■ | Non-UK | 23.2% |
| ■ | London | 20.3% |
| ■ | South East | 14.1% |
| ■ | East of England | 12.0% |
| ■ | Scotland | 9.1% |
| ■ | Yorkshire & The Humber | 5.8% |
| ■ | South West | 4.6% |
| ■ | North West | 4.6% |
| ■ | West Midlands | 3.3% |
| ■ | North East | 2.5% |
| ■ | Northern Ireland | 0.4% |

## Who we've funded, to date, by gender*

| | | |
|---|---|---|
| ■ | Male | 43.9% |
| ■ | Consent not given | 43.0% |
| ■ | Female | 11.0% |
| ■ | Prefer not to say | 2.2% |

\* Figures do not include Activation Partners or the first round of seed funding from Nature Computes Better.

# 2. Implementing our ethics and social responsibility framework

From the outset, we recognised that pursuing research at the edge of the possible would often mean operating without clear social consensus. The potential technologies and discoveries emerging from our programmes could have far-reaching, uncertain impacts on society. That makes taking a responsible approach essential to everything we do. As we explored questions of ethics and social responsibility (ESR) in what we fund, we looked for ways to embed these considerations within our programmes — helping us better understand and shape their societal impact. These include:

- We build in public — engaging with diverse voices across and beyond scientific communities, from industry and academia to civil society, and openly publishing and inviting feedback on opportunity spaces and programme theses before launching a solicitation.
- Many of our programmes include a dedicated strand focused on funding research that explores the ethical, socio-economic, governance, or legal dimensions of the work.
- We bring in expert support to ensure researchers' approaches to communication and engagement are robust, reflect best practice, and build on lessons from similar work. How researchers engage with the communities they aim to serve — including the general public — is a core consideration in our programmes.
- Given the complexity of these considerations, we've established a dedicated group of external Ethics and Social Responsibility (ESR) Advisors to support Programme Directors throughout their journey.
- All ESR-related issues within programmes are reviewed by the Board's Ethics and Social Responsibility sub-Committee.
- Certain programmes, such as Exploring Climate Cooling, have also set up additional oversight mechanisms to strengthen research governance.

## Q SPOTLIGHT

### Strengthening governance in Exploring Climate Cooling (ECC) programme

ARIA's Exploring Climate Cooling programme operates in a complex and controversial research field. With little precedent of how such novel research should be done responsibly, the team understood that success will be defined as much by how it can evidence the safety of the approaches being explored, as by its feasibility. An independent oversight committee was established to strengthen the governance of the programme. Made up of international experts, this committee has three roles which recognise the intrinsically global nature of climate tipping points and, therefore, the need for any solution to involve open international cooperation, collaboration and transparency:

- Supporting ARIA's leadership in the effective oversight and governance of the experiments conducted as part of this programme.
- Shaping the development of internationally accepted and responsible norms and standards for oversight and governance of outdoor experiments of approaches for actively cooling the Earth.
- Identifying constructive ways to contribute to the wider international discussion on possible governance mechanisms for these approaches.

"ARIA's principles of governance, oversight and transparency are vital to ensure that research is carried out in a responsible, ethical manner with full accountability. We will implement these principles by working closely with affected communities and carefully monitoring any potential ecological or societal impacts. Through open reporting and dialogue, we will ensure our work remains aligned with both scientific integrity and public benefit."

Dr Shaun Fitzgerald
Creator from Re-thickening Arctic Sea Ice project

# 3. Designing our programme management principles

**Active management**

ARIA is building a robust process and baseline benchmarks for active management at the programme and project levels, overseen and driven by the Programme Directors.

Our Programme Directors are committed to responsiveness, with quarterly monitoring in place across all programmes.

We're also developing project management benchmarks, specifically focusing on 'Amber/Red' status for progress and speed, alongside documented corrective actions. Programme Directors hold project teams accountable for transparent reporting and the proactive development and execution of remediation plans when projects deviate from their intended trajectory.

Programme Directors also develop a comprehensive annual evaluation of their projects, providing the insights to guide future management and funding decisions.

## Design for outcomes first

We ask ourselves, what's the end goal?

What needs to be demonstrated to globally shift the conversation and justify further investment in a world-changing capability?

What are the critical risks that could prevent achieving that final milestone? What would unambiguously demonstrate progress towards mitigating it?

## Plan for success

If success can't be defined, a project shouldn't be funded.

Design for success first then plan activities, timelines and budgets.

## Keep the bar raised

Ensure the number of milestones is appropriate for the project's complexity, with at least one major milestone per year and ideally one per critical risk area.

Ensure each milestone is clear, measurable and unambiguous.

We won't accept conservative milestones. ARIA funds ambitious projects, and while failure is possible, lack of ambition isn't acceptable.

## Responsibility

Programme Directors are responsible for managing projects to achieve world-changing results, using these guidelines as a foundation, while adapting them as needed.

# What's next

# Meet our next cohort of Programme Directors

**After a year of programme launches from our first cohort, and more than £400m in funding committed to the R&D ecosystem, we've gained a deeper understanding of what ARIA's optimal steady state should look like.**

With this clearer picture emerging, the question now is how we create maximum impact within both the UK ecosystem and our budget. The answer isn't constant scaling — that would require a different operational model and risks diluting our singular focus.

There is, however, an opportunity to grow our surface area in a way that builds on these foundations, while keeping our focus. With this in mind, we've welcomed a new cohort of Programme Directors — a process we expect to repeat every other year, as existing cohorts roll off. This approach helps maintain a balance between mature programmes and new opportunity spaces, ensuring we continue to operate at the edge of what's possible without becoming too big or too thinly spread.

Our eight new Programme Directors will push our work into entirely new scientific domains, with the potential for exponential progress increased by their deep entrepreneurial experience.

Throughout our search process, we looked beyond impressive academic credentials to find leaders with proven track records for building ventures, communities and technologies of societal and economic significance. We sought out individuals with deep technical knowledge, relentless curiosity, the conviction to challenge conventions and an intrinsic motivation for outsized impact.

Joining ARIA from the UK, Europe and USA, our new PDs are being empowered to convene and lead new scientific communities, and ultimately push the limits of the possible.

" As Programme Directors, we have a duty and an opportunity to take these high risk bets and kick start a snowball that's going to go beyond ARIA and be picked up by different industries, different investors, to have the highest possible impact over time."

Alex Obadia
Programme Director

# Cohort 2

### Alex Obadia

Alex is an entrepreneur, researcher, and early-stage investor exploring the frontiers of quantum cryptography. He co-founded Flashbots, a unicorn R&D organisation working to preserve the decentralisation and permissionlessness of blockchain systems. Flashbots' R&D sparked the Maximal Extractable Value (MEV) industry and its software has helped generate nearly £1.7bn.

### Ivan Jayapurna

Ivan joins ARIA from the University of California, Berkeley. While studying, Ivan co-led several tech spinout efforts, was twice funded by the National Science Foundation I-Corps, and co-founded a technical consultancy for biotech startups.

### Claire Donoghue

Claire will join ARIA from her role as Senior Director in Data Science and AI at AstraZeneca. With two decades' experience in machine learning, she has delivered solutions across healthcare, manufacturing, and occupational safety. Claire is an inventor on 19 patents and holds a PhD in machine learning from Imperial College London.

### Nathan Wolfe

Nathan is a renowned virologist, epidemiologist, and entrepreneur. Most recently, he was a Visiting Scholar in Stanford's Bioengineering Department, having previously founded initiatives to quantify epidemic and pandemic risk, and coordinate scientists globally to spot emerging pathogens. He served on DARPA's Defense Sciences Research Council.

# Cohort 2 continued

### Brian Wang

Brian co-founded the non-profit Panoplia Laboratories to pre-develop medicine for the next pandemic. Brian has a PhD in chemistry from the University of California, Berkeley, conducted postdoctorate research in synthetic biology at MIT, and was Head of R&D at vaccine development startup Alvea.

### Nicole Wheeler

Nicole joins ARIA from the University of Birmingham, where she researched the potential of genomics and AI to detect and track new infectious diseases. She developed the UK's first software for screening synthetic DNA for potential biohazards. Nicole is also a technical expert for the AIxBio Global Forum and contributed to the world's first International AI Safety Report.

### Yannick Wurm

Yannick joins ARIA from Queen Mary University of London, where he is Professor of Evolutionary Genomics & Bioinformatics. Yannick pioneered the use of molecular tools to assess pollinator health, has built startups to commercialise genome analysis software, and created a real-time network for pollinator monitoring.

### Rico Chandra

Rico is a repeat founder who cut his teeth at the frontier of defence technologies. He has advised governments, investors, and high-growth companies on emerging tech and their strategic impact. He founded Arktis Radiation Detectors, whose systems are now deployed worldwide. Rico holds a PhD in dark matter detection from CERN and an MSc from ETH Zurich.

We owe our momentum this year to everyone who generously shared their time, insight, and support as ARIA continues to grow — with particular thanks to our sponsor, the Department for Science, Innovation and Technology, for their steadfast backing.

Advanced
Research
+Invention
Agency

ARIA