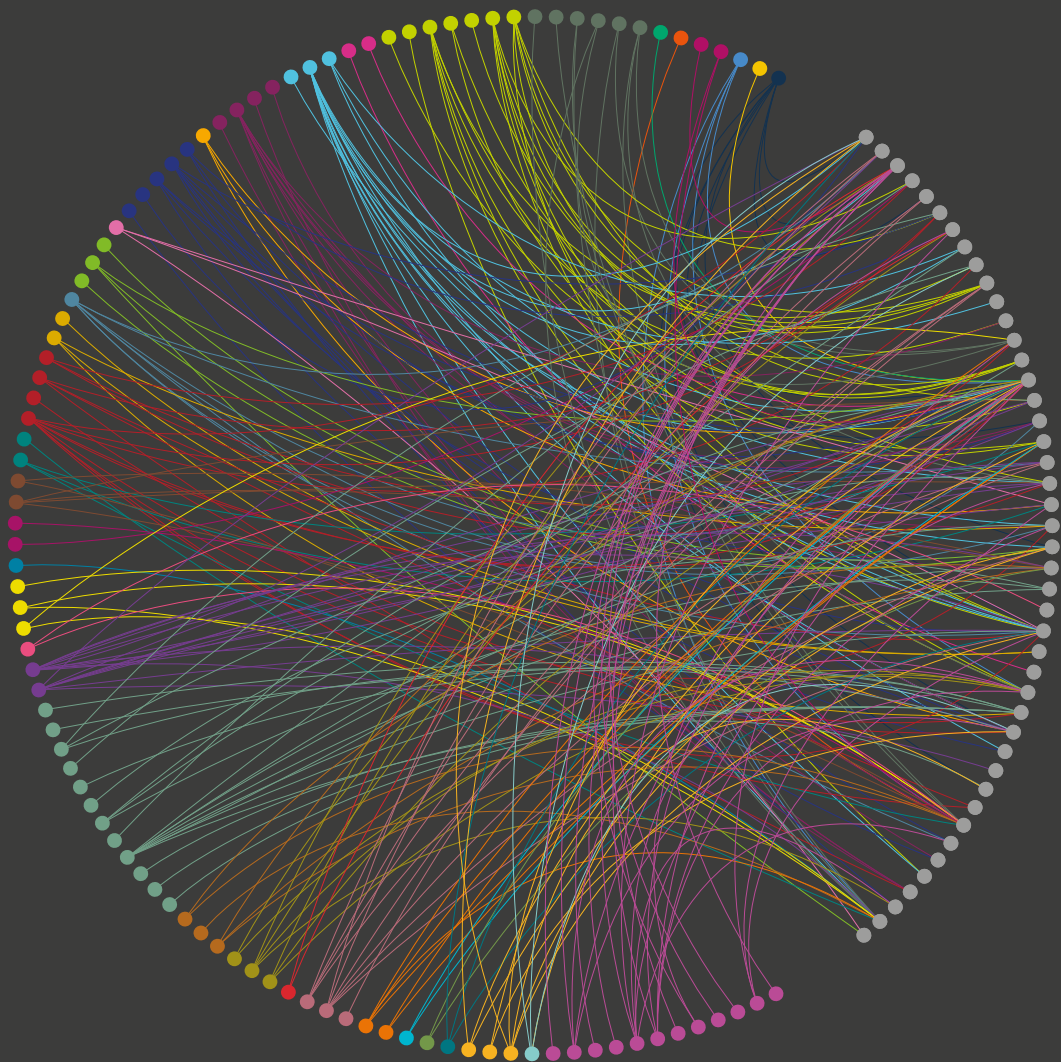


# IDEAS INTO ACTION

10 YEARS OF GROUNDBREAKING RESEARCH



# IDEAS INTO ACTION

Ideas into Action provides highlights from the first ten years of the Oxford Martin School.

Our researchers have achieved far more than we can include in one report, so please visit our website for more:

[www.oxfordmartin.ox.ac.uk](http://www.oxfordmartin.ox.ac.uk)





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# INTRODUCTION

PROFESSOR IAN GOLDIN



The Oxford Martin School has achieved an immense amount in its first ten years. We have addressed many key global challenges and look forward to accomplishing much more.

Infectious diseases for which there are known cures still kill millions of people each year. Inequality is growing, and nearly two billion people remain in poverty. While our research continues to focus on such issues, we are also looking at the spillovers of progress – including climate change, degradation of natural resources, antibiotic resistance and ageing societies.

A sense of urgency drives us to address a wide range of concerns; the same urgency that inspired James Martin to establish the Oxford Martin School. As we witness the fruits of our early investments, the breakthroughs in research and their impact reinforce our optimism regarding future prospects.

Since 2005, we have aimed to sow the seeds of change, acting as a ‘kickstarter’ for experimental and novel research. A decade on, many of these programmes have matured into independently funded institutes, allowing us to focus on new collaborations, experimentation and new ideas.

Much has changed since I joined as founding Director. Then, as now, funding councils and other grant-makers have struggled to support interdisciplinary research. Our ability to address intractable problems comes from our capacity to assemble interdisciplinary teams. Their success demonstrates what can be achieved when top scholars are freed of disciplinary shackles.

The Oxford Martin School provides core funding but contributions from other funders have more than tripled the resources available. This leverage, together with the quality of the research and its impact in a range of government and business circles, is testimony to the success of James Martin’s vision.

A major achievement has been the establishment of a permanent home for the Oxford Martin School in central Oxford. Our lecture theatre, seminar rooms and other facilities have allowed us to welcome thousands of people to events.

Our second decade has begun with the introduction of thematic research competitions. The first, in 2015, focuses on management of the global commons, with research projects initiated on oceans, pandemics and antibiotic resistance, and energy systems. These add to our wide research portfolio, a sample of which is outlined in this report.

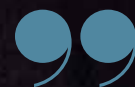
As we look forward to the coming decade, we have no doubt that the sense of urgency and optimism that imbues the Oxford Martin School will make an even more significant impact. We hope you find our work of interest and look forward to engaging with you.

*Professor Ian Goldin is Director of the Oxford Martin School and Professor of Globalisation and Development, University of Oxford.*

A portrait of James Martin, an older man with grey hair, wearing a dark pinstripe suit, a white shirt, and a yellow patterned tie. He is smiling slightly and looking towards the right.

**We can  
make any  
kind of  
world we  
want**

**James Martin**  
(1933-2013)



# VISION & AIMS

The Oxford Martin School at the University of Oxford is a world-leading centre of pioneering research that addresses global challenges.

**45**

TEAMS

We invest in research that cuts across disciplines to tackle a wide range of issues such as climate change, disease and inequality. We support novel, high risk and multidisciplinary projects that may not fit within conventional funding channels. We do this because breaking boundaries can produce results that could dramatically improve the wellbeing of this and future generations.

We seek to make an impact by taking new approaches to global problems, through scientific and intellectual discovery, by developing policy recommendations and working with a wide range of stakeholders to translate them into action.

**500**

ACADEMICS

Established in 2005 through the generosity and vision of Dr James Martin (1933-2013), the Oxford Martin School provides academics with the time, space and means to work collaboratively and to engage more effectively with policy makers, business people and the general public.

To qualify for our support, the research must be of the highest academic calibre; tackle issues of a global scale; could not have been undertaken without our support; and have a real impact beyond academia.

All research teams are based within the University of Oxford.

**100**

DISCIPLINES

In the first ten years, we have funded 45 teams, bringing together over 500 academics from more than 100 academic disciplines. The work our researchers do is inspiring, lasting and is making an impact on the world.

This report is a celebration of the first ten years of our work. While it cannot cover every breakthrough, we hope it gives you a snapshot of how far we have come and of our future direction.



James and Lillian Martin helped to create an institution of huge value to our academic community and to the world outside. We are proud of what the School is doing in the name of its original benefactors.

# JAMES MARTIN: VISIONARY

THE RT HON THE LORD PATTEN OF BARNES CH

‘Visionary’ is the sort of word we throw about rather randomly. It is not always deserved.

However, it really was a fair description of James Martin, one of the most generous benefactors in the University of Oxford’s history.

I remember my first serious conversation with Jim and his wife, Lillian, in my drawing room in London. He set out what he wanted to achieve with the creation of a new and very well-endowed school at Oxford. His aim was to push back the boundaries of scholarship to find practical solutions to some of the biggest challenges of the 21st century. He was determined to support co-operative, groundbreaking work, which would encourage scholars to leave their academic silos in order to promote the sort of lateral thinking at which Jim himself excelled.

That is exactly what has been happening for ten years of increasingly successful work at the Oxford Martin School. In addition to forging links across the University, the School has also understood that to achieve its aims it needs to connect with governments, business and policy makers. It has been extraordinarily successful in increasing the impact of the University’s research.

I was proud to be involved personally with the School as a member of the Oxford Martin Commission for Future Generations, the flagship policy initiative that brought together 19 world leaders. With the publication of its report in 2013, the School created considerable momentum for change. **Now for the Long Term** has been downloaded well over a million times and its key recommendations are being followed up in numerous places.

We all look forward to the next decade of the Oxford Martin School. It has made a great start. It has the potential to do much more by making a significant impact at the intellectual crossroads of the world, discovering scientific breakthroughs, providing evidence-based policy recommendations in numerous fields, and actively engaging with policy makers both here in the UK and internationally.

James and Lillian Martin helped to create an institution of huge value to our academic community and to the world outside. We are proud of what the School is doing in the name of its original benefactors.

*Chris Patten (The Rt Hon the Lord Patten of Barnes CH) is Chancellor of the University of Oxford and a member of the Oxford Martin Commission for Future Generations.*



**BILLION**  
PEOPLE IS THE EXPECTED  
GLOBAL POPULATION  
BY 2050

# OPTIMISM AND URGENCY

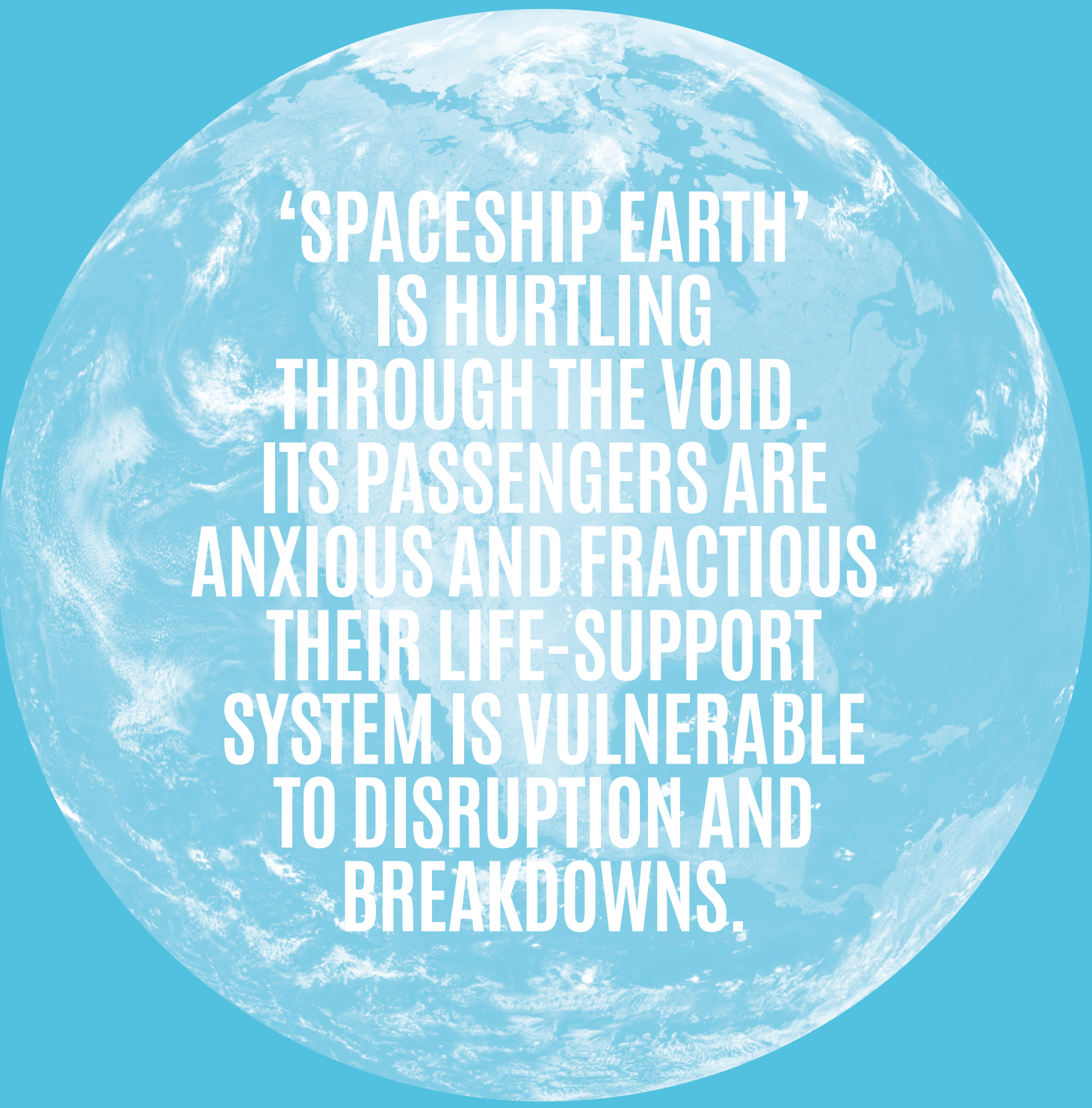
We have the potential to improve dramatically the wellbeing of people across the planet

James Martin founded the Oxford Martin School because he believed that this century, and specifically the next few decades, presents a crossroads for humanity. The sheer scale and speed of change means that we now have the power to destroy possibilities for future generations. Equally, we have the potential to improve dramatically the wellbeing of people across the planet.

This combination of optimism and urgency characterises the Oxford Martin School.

The Oxford Martin School brings together a vibrant community of scholars, drawn from across the University of Oxford.

We undertake rigorous academic research on a wide range of global challenges. Our research covers the frontiers of medicine, the physical and environmental sciences, social sciences and humanities. In this section we illustrate the diversity of our research, with programmes that seek to solve problems from vaccines and global health, to tropical forests, and the risks of future technologies.



**‘SPACESHIP EARTH’  
IS HURTLING  
THROUGH THE VOID.  
ITS PASSENGERS ARE  
ANXIOUS AND FRACTIONOUS.  
THEIR LIFE-SUPPORT  
SYSTEM IS VULNERABLE  
TO DISRUPTION AND  
BREAKDOWNS.**

# A LEGACY FOR FUTURE GENERATIONS

THE LORD REES OF LUDLOW OM Kt HonFREng FRS



**James Martin was an enthusiast for science and technology. But he realised that technology had a ‘dark side’ too, and that in the 21st century the stakes were higher than ever before.**

Earth is 45 million centuries old. But this century is the first when one species - ours - can determine the biosphere’s fate. Jim founded the Oxford Martin School to focus expertise on global challenges and thereby enhance the chance of a bright future.

A few forecasts about 2050 can be made with fair confidence. The world will be more crowded and warmer. Our collective ‘footprint’ will threaten our finite planet’s ecology unless we can achieve more efficient use of energy and land. But we can’t predict the path of future technology, still less the speed of its advances; today’s smartphones would have seemed like magic even 20 years ago. So, in looking decades ahead, we must keep our minds open to innovations that may now seem science fiction. These will offer great hopes but also great fears.

By 2050, our society will surely have been further transformed by computers and robotics. But will they be idiot savants or will they display near-human capabilities? Should we be concerned that they might ‘go rogue’?

Likewise, we can predict huge advances in biotech, offering bright prospects for medicine and agriculture but raising novel and challenging ethical conundrums.

Society is more interconnected than ever before and consequently more vulnerable. We depend on elaborate networks. Can we be sure that these networks are resilient enough to rule out catastrophic disruptions cascading through the system - real-world analogues of the 2008 financial crash? London would be instantly paralysed without electricity. Supermarket shelves would soon be bare if supply chains were disrupted. Social media can amplify panic and rumour at the speed of light.

‘Spaceship Earth’ is hurtling through the void. Its passengers are anxious and fractionous. Their life-support system is vulnerable to disruption and breakdowns.

These concerns present huge challenges to governance. But the political focus in all nations is on the local rather than the global, and on the immediate rather than the long term. There is too little horizon-scanning and too little concern about the legacy we may leave for future generations.

So little, indeed, that the Oxford Martin School can have a benign worldwide influence. It is superbly placed to draw

on expertise across all disciplines. That is what is needed if we are to assess which threats are credible versus which will stay science fiction, and to explore how to enhance resilience against the more credible.

We cannot be complacent that newly-emergent global risks are miniscule. It is an important maxim that the unfamiliar is not the same as the improbable. But we must not let these anxieties put the brakes on all innovation.

There is a genuine tension here. Undiluted application of the ‘precautionary principle’ has a manifest downside. If we take no risks we may forgo disproportionate benefits. We need to develop guidelines for responsible innovation, in the hope that the world stands the best chance of evolving, without catastrophic setbacks, towards the utopia that James Martin envisioned. His magnificent benefaction therefore resonates far beyond Oxford - indeed worldwide.

*Martin Rees (The Lord Rees of Ludlow) is a member of the Oxford Martin School’s Advisory Council and the Oxford Martin Commission for Future Generations. He is Astronomer Royal, and Emeritus Professor of Cosmology & Astrophysics and co-founder of the Centre for the Study of Existential Risk at the University of Cambridge.*



# FUTURE OF HUMANITY INSTITUTE

A handful of emerging technologies such as artificial intelligence (AI) and biotechnology could fundamentally transform the human condition

The Institute's research was the impetus for a \$10 million programme on reducing risk funded by Elon Musk, £1 million of which has been awarded to the Future of Humanity Institute.

## Director

**Nick Bostrom**

Professor of Philosophy

## Overview

**Challenge:** A handful of emerging technologies such as artificial intelligence (AI) and biotechnology could fundamentally transform the human condition or create unprecedented risks to civilisation and biosphere alike. Humanity needs to prioritise emerging risks and opportunities, determine the interaction effects between emerging technologies, and identify actionable interventions that could improve humanity's potential.

**Ambition:** To clarify the choices that will shape humanity's long-term future by bringing excellent scholarship to bear on neglected big-picture questions that are critically important for humanity's future.

**Approach:** Using the tools of mathematics, philosophy and science, this programme explores the risks and opportunities that will arise from technological change, weighs ethical dilemmas, and evaluates global priorities.

## Progress

In addition to advancing the field of research into global risks and existential threats, the team has made significant contributions to awareness and debate on humanity's future amongst the public, policy makers and business leaders.

The work of Professor Bostrom and colleagues highlighting the potential risks associated with 'super intelligent' AI has garnered the support of high profile thinkers such as Professor Stephen Hawking and Bill Gates.

The Institute's research spurred the creation of sister institutes, the Future of Life Institute (at MIT) and the Cambridge Centre for the Study of Existential Risk and was the impetus for a \$10 million programme on reducing risk funded by Elon Musk, £1 million of which has been awarded to the Oxford Martin School institute.

The team partnered with insurers Amlin to bring together experts in ecology, complex systems, catastrophe modelling, psychology, and economics to better understand the potential systemic risks of quantitative modelling.

They have developed a roadmap for research into making artificial intelligence safe and beneficial for society.

Members of the team have helped to inform strategic policy discussions internationally, including the US President's Council on Bioethics, US State Department, the World Bank, the UK Cabinet Office, the UK Government Office for Science, the Finnish Foreign Ministry and the German Foreign Ministry, as well as several leading AI companies.



# OXFORD MARTIN PROGRAMME ON VACCINES



HEPATITIS • PANDEMIC INFLUENZA • MALARIA  
TUBERCULOSIS • HIV/AIDS • MENINGITIS

## Overview

**Challenge:** The WHO's World Statistics Report for 2015 shows that more than a quarter of infant deaths are from infectious diseases, and although adult deaths from infectious diseases in the global population are decreasing, they still outrank non-communicable diseases in many poorer nations. The threat of pandemics and mortality from endemic diseases will continue to pose great challenges for vaccine research and development in coming decades.

**Ambition:** To design and develop new vaccines against infectious diseases of global health importance, focusing on six key targets: hepatitis, pandemic influenza, malaria, tuberculosis, HIV/AIDS and meningitis.

**Approach:** The Oxford Martin Programme on Vaccines brings together Oxford's diverse range of vaccines research. The collaboration provides a spectrum of expertise unparalleled elsewhere in academia and it enables researchers to move between groups, sharing valuable new perspectives and insights.

## Progress

Members of the Oxford Martin Programme on Vaccines were part of the collaboration that developed a new vaccine to protect against meningitis B. In September 2015, the vaccine, Bexsero, became part of the UK's childhood immunisation scheme.

Work to stabilise a key component in vaccines against meningococcal disease, enabling them to be stored for months rather than days, has been taken up by Novartis.

Clinical trials are underway into vaccines designed to induce immunity against all types of influenza.

Researchers have developed a new attenuated respiratory virus that could be used as a carrier for vaccines against influenza, dengue and hepatitis C virus.

Novel, needle-free, vaccine delivery routes have been developed by the team and are now at patent application stage.

## Co-Directors

### Adrian Hill

Professor of Human Genetics

### Susan Lea

Oxford University Statutory Chair of Microbiology

### Andrew Pollard

Professor of Paediatric Infection and Immunity

### Christoph Tang

Glaxo Professor of Cellular Pathology

## Potential

Set up by the programme, the Oxford Vaccine Centre will enable large-scale testing and evaluation of new vaccines, as well as vital insights from the study of the development of immunity.

World-leading work on population biology and structural biology will help researchers create vaccines that can deal with the genetic diversity of pathogens.

In the fight against tuberculosis, HIV, malaria, hepatitis C and influenza, the programme's work on inducing powerful immune responses will play an important role in creating new vaccines to protect against difficult pathogens.

Creating a new framework to deal with the economic aspects of vaccine access and use will strengthen the potential for innovative new vaccines to reach the people who need them most.





# OXFORD CENTRE FOR TROPICAL FORESTS

3  
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40  
RESEARCHERS

10  
PROJECTS

## Director

**Yadvinder Malhi**

Professor of Ecosystem Science

## Overview

**Challenge:** Tropical forests house half of all the planet's biodiversity, much of which has yet to be observed or described. To protect these resources, there is a need to improve governance within the forest sector.

**Ambition:** To strengthen understanding of how state and non-state institutions and actors shape decisions about the conservation and use of forest resources around the world.

**Approach:** The Oxford Centre for Tropical Forests brings together Oxford's vast intellectual capital and expertise on practical issues, creating a unique network of University departments and relevant NGOs, consultancies and businesses. It is a platform for broader collaboration between Oxford institutions and the global forest community.

## Progress

Since 2009, the forest governance team has worked with partners at the Universities of Queensland and Copenhagen, and the UN Environment Programme's World Conservation Monitoring Centre to create the Global Database on Protected Area Management Effectiveness - the only global database on protected area management. This now holds data for over 9,000 protected areas and is being used to track progress towards international conservation targets, and to measure the impact of protected area management interventions in conserving the world's biodiversity.

The team's work has also fed into management of temperate forest landscapes, through INTEGRAL, an EU-wide project. They have been reviewing current knowledge on the EU's global footprint, assessing EU policy responses, and considering how this might inform participatory processes addressing land use in the EU.

In 2012, the Centre launched the Global Ecosystem Monitoring network (GEM), an international effort to understand and measure forest ecosystems and how they will respond to climate change. The network now spans three continents, with data being gathered by more than 40 researchers across 10 projects. A busy online portal allows an international team to exchange knowledge, results and best practice.

Centre researchers are part of an international team that includes think tanks and NGOs, working to analyse the links between ecosystem services and sustainable poverty reduction. A policy framework is being developed that will help decision makers minimise negative impacts and help reduce poverty.

## Potential

The Centre's contribution to research in this field is already helping to shape policy and management frameworks in many areas of the world, and has the potential to protect vital areas of forest.



# PROVIDING HEALTHCARE FOR ALL WHO NEED IT

PROFESSOR ROBYN NORTON



**We need to shift towards providing more healthcare out of hospitals - in primary care and in the community.**



Most people in the world currently do not have access to safe, effective and affordable healthcare. Without major change, this situation is likely to get worse in both high-income countries and emerging economies. Globally, demand for health services is predicted to rise, due to a range of factors including population growth and increased longevity. Changes in the burden of disease are driving cost increases, with more people requiring long-term care due to non-communicable and chronic diseases. Middle class expectations of quality of care are growing, especially in emerging economies. In short, systems are under pressure.

To avert a major crisis, we need transformative change in the way healthcare is delivered. Such change will require a rigorous scientific approach to finding and evaluating solutions. We need to develop and utilise low cost, but effective, drugs and devices. Affordable technologies, such as mobile devices, will be vital. We must harness the new breed of social entrepreneurs to develop innovative, “out of the box” and financially sustainable approaches to healthcare.

We need to shift towards providing more healthcare out of hospitals - in primary care and in the community, closer to where people live. Much of this will be achieved by realising the potential of technology. By increasing

the number of non-physician healthcare workers using diagnostic and health monitoring software, and by getting patients actively involved in their own care through self-management and monitoring in the home, a shift away from expensive hospital care will be possible for many chronic conditions. This will need to be supported by a more substantive investment in prevention activities and the mobilisation of populations to take an active role in their health.

We cannot assume that governments and national health services will lead the way; considerations of finance and politics too often dictate their priorities. So others must contribute to the solution. The George Institute for Global Health was established, in large part, to identify innovative solutions for the delivery of healthcare, using rigorous scientific approaches. Already established in Australia, in 2010 the Oxford Martin School provided seed funding for the Institute to establish a multidisciplinary team in Oxford.

Since then, the Oxford team has grown from two to 25 staff, and in collaboration with George Institute offices in Australia, China and India, has initiated groundbreaking research both in the UK and abroad.

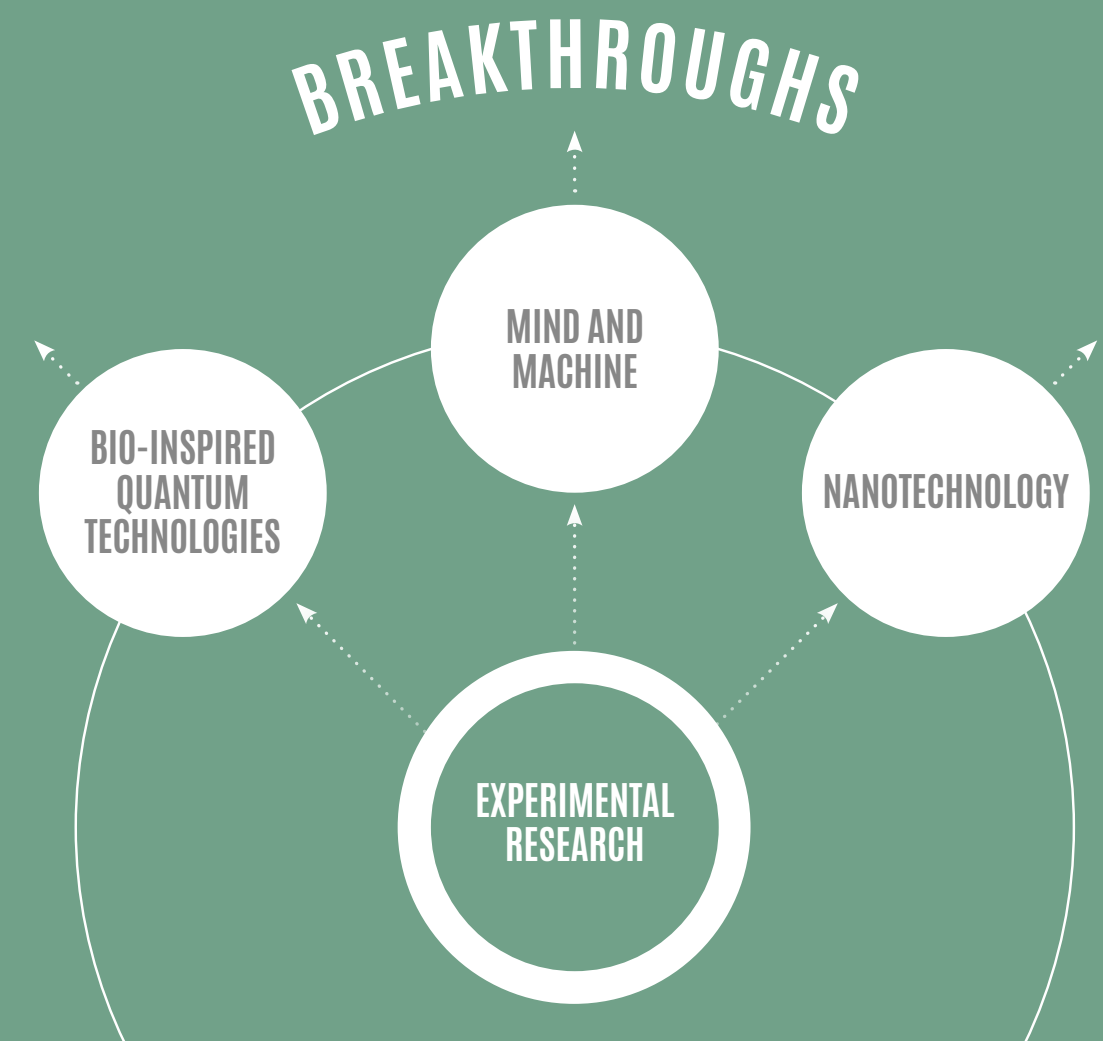
*Professor Robyn Norton is Co-Principal Director, The George Institute for Global Health*

# NOVEL AND EXPERIMENTAL RESEARCH

The Oxford Martin School supports experimental research that aims to result in major breakthroughs.

Our role as an incubator has allowed researchers the freedom to pursue innovative projects that would otherwise struggle to get off the ground, but which could have a dramatic impact both in their field and in real world applications.

Over the past ten years, we have provided early funding to many such projects. These include the Oxford Martin Programme on Bio-Inspired Quantum Technologies, the Oxford Martin Programme on Mind and Machine, and the Oxford Martin Programme on Nanotechnology.





# OXFORD MARTIN PROGRAMME ON BIO-INSPIRED QUANTUM TECHNOLOGIES

5

DISCIPLINES

25

ACADEMICS

## Co-Directors

**Dieter Jaksch**  
Professor of Physics

**Vlatko Vedral**  
Professor of Quantum  
Information Science

“Jim Martin’s support was crucial in making this work possible. His long-term vision was that a quantum computer would have an immediate impact on many problems facing us in the 21st century, such as modelling complex systems, be they weather patterns or drug developments. The Oxford Martin School funding of our programme has been instrumental in establishing new collaborations where we needed to pull together resources and expertise from physics, bio-physics, material science and computing.”

Professor Vlatko Vedral



## Overview

**Challenge:** The energy demands of large-scale computing are reaching unsustainable levels; at the same time, today’s super computers cannot handle the modelling and data processing that many scientists require. Quantum technology could offer a new form of computing to tackle both issues.

**Ambition:** To open up the possibility of designing the building blocks of quantum computers by learning how biological and organic structures process information, and by copying their design in artificial structures.

**Approach:** Oxford Martin School funding has initiated a new way of working in physics, bringing together 25 academics from five disciplines to work on this highly experimental challenge. The approach is radically different to expensive traditional approaches such as ion trapping, superconducting qubits and quantum optics.

## Progress

The team is working towards a detailed description of certain processes taking place in organic systems, such as photosynthesis. This will inform the design principles of artificial systems capable of maintaining long-lived quantum coherence.

They have successfully modelled the role that quantum coherence plays in energy transfer in organic polymers, with hopes of incorporating them in future computer networks.

## Potential

Quantum processors would allow for fast, energy-efficient computers. As well as the potential for saving energy, they will open up new kinds of problems that today’s computers cannot begin to tackle.



# OXFORD MARTIN PROGRAMME ON MIND AND MACHINE

## Co-Directors

**Jonathan Flint**

Professor of Molecular Psychiatry

**Gero Miesenböck**

Waynflete Professor of Physiology

**Scott Waddell**

Professor of Neurobiology

**A detailed understanding of the brain's neural circuits is vital if we are to find new – effective, affordable, and safe – interventions.**



## Overview

**Challenge:** Neurological and psychiatric disorders (such as depression, dementia, epilepsy, addiction and compulsion) are some of the hardest to understand and treat, and the costs and impact are growing in an ageing population. A detailed understanding of the brain's neural circuits is vital if we are to find new – effective, affordable, and safe – interventions.

**Ambition:** To uncover how cognitive processes work at a mechanistic level, in order to understand the neuronal operations underpinning our mental lives.

**Approach:** The team brings together neurobiology, psychiatry, molecular genetics, theoretical and computational neuroscience, and engineering to understand mechanisms of information processing in the brain. Research is mainly performed in fruit flies, where physical events in nerve cells can be linked to higher brain function more easily than in other animals.

## Progress

Scientists in the team have been recognised for the development of optogenetics and many fundamental discoveries concerning the neural control of behaviour. The team has recently:

- Identified cellular and molecular signalling mechanisms involved in food seeking, drinking and sleep, uncovering the role of particular dopamine-releasing neurons in the control of each of these behaviours.
- Progressed with understanding how neural circuits keep track of waking time for the regulation of sleep.
- Localised sites of neural plasticity in the brain that are likely to represent modifications during learning.
- Begun to understand how a decision process unfolds over time as information accumulates.

## Potential

A better understanding of the signalling mechanisms impacting sleep, eating and drinking behaviours could make it feasible to screen for potential drugs with clinical application. Dopamine transmission is central to memory, addictive, compulsive, and movement disorders in humans, so there is long-term potential for new interventions for many of the most difficult neurological conditions.

With extensive translation, development of neural-machine interfaces that link a functioning brain to prosthetic devices and machines could be possible.



**Events in nerve cells can be linked to higher brain function more easily in fruit flies than in other animals.**



# OXFORD MARTIN PROGRAMME ON NANOTECH- NOLOGY

## NEW TECHNIQUES KEEP NANOSTRUCTURES STABLE

FOR OVER  
**2YRS**

AND UP TO  
**42°C**

### Drug Delivery Systems

**Challenge:** Most drugs are blunt instruments; they affect healthy cells as well as treating unhealthy ones. In cancer, chemotherapy can destroy healthy cells, causing extreme side effects, such as loss of immunity. Working at the nanoscale could make it possible to target specific proteins in specific cells.

**Ambition:** To develop a drug delivery system that allows for a new class of nanoscale drugs; a scale so tiny that drugs target affected cells only, resulting in fewer side effects and more effective, efficient treatment.

**Approach:** Biologists, physicists and chemists are working together to identify how potentially suitable materials behave at the nano level and how they might be made stable in order to be used for drug delivery.

### Progress

The team is developing several nanostructures such as carbon nanotubes that, once delivered into the body, would allow drugs to reach unhealthy cells only and bypass healthy cells.

Dr Trigueros has developed a technique to keep nanostructures stable for more than two years and in temperatures up to 42°C, by wrapping DNA around the structure. This allows nanostructures

to be mass-produced, to be used in fluids, freeze-dried and as powder, maintaining stability. The technique is currently in the patent process.

The group has managed to attach molecules to the DNA wrapper that will recognise proteins on the cancer cell membrane, and has identified how to make the DNA unwrap once the nanotube is inside the tumour cell, releasing the drugs stored inside.

### Potential

This approach could eventually be made universal and able to be deployed at the very early stages of tumour formation. Long term, this could allow for a pill to be taken by healthy people at regular intervals as a preventative treatment, working in tandem with the immune system to intervene before cancerous cells form a tumour.

Apart from drug delivery in cancerous cells, these smart systems will also have universal applications in drug/protein delivery for stem cells, facilitating cell therapy in regenerative medicine.

### Nano-Bio Materials

**Challenge:** Over the next decade we expect nanomaterials to make a fundamental contribution to creating artificial tissue and eventually to regenerate tissue damaged by disease or trauma.

### Co-Directors

#### Nano-Bio Materials

#### Dr Sonia Contera

Associate Professor in  
Biological Physics

#### Nano Drug Delivery Systems, Nano Antibiotics, Nano Catalysts

#### Dr Sonia Trigueros

Academic Fellow in Biological Physics

Nanotechnology has the potential to transform biomaterials by tuning their properties at the nanoscale to unlock the body's innate powers of organisation and self-repair, harnessing the regenerative capacity of tissue.

**Ambition:** To create nanomaterials that mimic the physical attributes of living tissue, where cells can grow and develop in conditions as close as possible to naturally occurring living systems.

**Approach:** This is a multidisciplinary collaboration of physicists, engineers, chemists, nanotechnologists and biomedicine researchers, with collaborations with several universities including Peking University and the University of the Basque Country.

### Progress

In collaboration with labs from all over the world, the team is creating materials based on nanocomposites of biopolymers with advanced nanomaterials for regenerating muscle and cartilage.

The team is also developing new physical methods to assess their properties and control their responses.

### Potential

As well as tissue regeneration, these materials could be used in drug testing, minimising the use of animals and humans.



# DEVELOPING A SUSTAINABLE FUTURE

JULIA MARTON-  
LEFÈVRE



At the start of the Millennium, the United Nations achieved something remarkable by adopting eight international development goals.

2015, the year that the Oxford Martin School celebrates its first decade, is also the year by which these Millennium Development Goals (MDGs) were to be achieved.

While progress and success have been varied, the goals did pull into focus the need for a global response to the most pressing challenges facing the world's poorest and most vulnerable people, and on the need for environmental sustainability.

The Oxford Martin School has played an important part in this global agenda. James Martin recognised that rigorous academic research was needed to underpin policy and, critically, he saw a clear need for academic researchers to stop looking at issues in silos, separated from each other. He made this a founding principle of the School.

As UN member states look towards the results of 2015 discussions on how to finance development, the adoption of a new set of ambitious Sustainable Development Goals, and agreement on action to slow climate change, we must ensure that equal attention is paid to the economic, environmental and social aspects of the wellbeing of humanity and the planet that supports us.

Conservation must play a much more central role. It has taken a long time for the world to recognise that biodiversity is essential to the wellbeing of our planet and its inhabitants. In 2010, the signatories to the United Nations Convention on Biological Diversity agreed to reduce biodiversity loss by 2020 through specific targets for action. In 2010, the UN General Assembly addressed the biodiversity crisis for the first time.

This commitment to action must continue and be closely linked to the targets and plans of the other multilateral environmental agreements, all aimed to ensure that the life-support system of our planet is maintained for this and future generations.

We are not yet doing enough to prevent biodiversity loss. In its Red List of Threatened Species, the International Union for Conservation of Nature documents the extinction risk of 76,199 species and, by 2014, found that nearly a third of these - 22,413 - are threatened.

This biodiversity loss has grim consequences for humanity, both in direct economic terms and in greenhouse gas emissions. However,

rays of hope pierce this gloom. Conservation has centuries-old roots, and it works. The recent toll of bird extinctions would have been 25% greater in the absence of conservation action. Protected areas are expanding worldwide, and they can prevent or reverse natural habitat destruction. The world's zoos, aquaria, botanic gardens and gene banks provide insurance for species and genetic diversity.

The Oxford Martin School has initiated a range of programmes that are playing a valuable role, including the Biodiversity Institute, the Centre for Tropical Forests and its new Sustainable Oceans Programme.

While the world is still mostly organised by disciplines and separate organisations, and with state-based environmental agreements, the issues themselves require the kind of global vision and co-operation that the Oxford Martin School encourages.

*Julia Marton-Lefèvre is a member of the Oxford Martin School's Advisory Board and the Oxford Martin Commission for Future Generations. From January 2007 to January 2015 she was Director General of IUCN, the International Union for Conservation of Nature. She continues to be active in a number of academic, NGO and corporate boards, and in 2016 will be a visiting fellow at Yale University.*

# COLLABORATION AND INNOVATION

To find solutions to complex, interconnected global issues, experts from different fields need to work together.

From the outset, the Oxford Martin School has promoted new ways of thinking about the future, initiating and encouraging collaborative projects.

All the research teams in the School work across traditional disciplinary divisions to gain fresh perspectives and to develop new approaches to their research questions. Helped by our early support of such teams, the value of an interdisciplinary approach is now recognised by many more funding bodies and academic institutions.

The Oxford Stem Cell Institute, the Oxford Martin Programme on the Future of Food, and the Institute for Emerging Infections are three examples of how the Oxford Martin School has created innovative research programmes using this collaborative approach.

COMPLEX  
PROBLEMS



# OXFORD STEM CELL INSTITUTE

£400,000 INITIAL INVESTMENT HAS HELPED LEVERAGE OVER

£60M

## Stem cell biology and regenerative medicine offer a novel way to model and understand intractable human diseases



### Co-Directors

#### Dr Paul Fairchild

University Lecturer in the Immunobiology of Stem Cells

#### Colin Goding

Professor of Oncology

### Overview

**Challenge:** Stem cell biology and regenerative medicine offer a novel way to model and understand intractable human diseases, facilitate drug discovery programmes, and provide the chance to intervene in the disease process, in order to effect a cure.

**Ambition:** To create a clear focal point for the stem cell community in Oxford, bringing together scientists who previously worked in isolation, offering a smoother transition of innovative ideas and discoveries from the laboratory to the clinic.

**Approach:** The Oxford Stem Cell Institute comprises 43 laboratories distributed throughout 17 departments of the University, and encompasses groups from both pre-clinical and clinical departments. In setting up the Institute, the Oxford Martin School also provided seed funding for speculative ideas that span traditional disciplines, thereby fostering the 'blue skies' thinking that fuels innovation.

### Progress

Seed funding has enabled researchers to obtain preliminary data from trials, as a foundation for larger proposals to external funders. From the Oxford Martin School's initial investment of approximately £400,000 the Institute has leveraged £60m.

The Institute is playing a major role in the €50m StemBANCC project, launched under the EU Innovative Medicines Initiative, which uses induced pluripotent stem cells to develop new treatments for complex conditions like Alzheimer's, autism and schizophrenia.

Researchers at the Institute have developed an innovative technique that could help the body's own immune cells attack cancer. This technical advance opens up the possibility of using stem cells derived from a patient's skin as a source of key immune cells, which can orchestrate an immune response against a tumour.

Researchers have been involved in major policy consultations, such as the House of Lords' Science and Technology Board Inquiry into Regenerative Medicine, and the UK Government's Strategy for UK Regenerative Medicine.



# RISING TO THE CHALLENGE OF GLOBAL FOOD SECURITY

PROFESSOR CHARLES GODFRAY

The last few decades have seen dramatic progress in reducing global hunger and steady, if less spectacular, progress on malnutrition. But the same period has seen frightening increases in the numbers of people who are overweight and obese, with all the attendant health problems.

The world population will probably peak this century at around ten billion, which means three billion more mouths to feed than in 2015. An increasing number of these people will be wealthy enough to demand the rich and varied diets that we currently enjoy in the developed world, and which require more resources to produce than simple diets.

This means that the global food system will experience a much greater demand for food at exactly the same time as the supply side will be stressed by increased competition for land, water and energy, and increasing potential disruption from climate change.

To understand the complexity of the food system and ensure that everyone has access to a secure supply of healthy and affordable food, an interdisciplinary approach to research is essential. Global food security will require action on agriculture and the food chain, on public health and dietary advice, and on governance issues such as better crafting of the rules of globalised trade in food. Action is needed on all fronts.



There are many researchers in the University working on different aspects of food, from plant molecular biologists trying to improve crop yields, to development economists, to health specialists attempting to understand the levers of diet change. Until recently there was no forum to bring together these diverse approaches, nor one common portal to allow the outside world to see what is happening at Oxford in this area of research.

The Oxford Martin Programme on the Future of Food seeks to fill this gap. Its activities link together more than eighty senior researchers, and many more students and post-doctoral researchers.

It has funded three novel interdisciplinary projects from teams across the University's academic divisions, and helps support the Food Climate Research Network. It has spearheaded the University's engagement with food system policy

makers, both in the UK and internationally.

The next fifty years will show whether humanity can feed itself sustainably and equitably without destroying its environmental life-support systems. This is an exciting and sobering challenge that will require the best interdisciplinary research from across the natural and social sciences.

*Charles Godfray is Hope Professor in the Department of Zoology, and Director of the Oxford Martin Programme on the Future of Food.*



# MATHS, MEDICINE AND INFECTIOUS DISEASE

PROFESSOR ANGELA MCLEAN



Over the past decade, emerging infectious diseases have rarely been long out of the news.

The world's worst ever Ebola epidemic in West Africa and the Global Pandemic of H1N1 influenza each dominated our vision of infections for a time. Meanwhile, the global HIV pandemic grinds on, with an estimated 35 million people living with HIV infection by the end of 2013.

The Institute for Emerging Infections was one of the first members of the Oxford Martin School. It was set up to bring together mathematical biologists and physicians to work on the problem of emerging infections. From its earliest days, its focus was upon the question of how fast can emerging viral infections adapt to their new human hosts. Such adaptation is a vital step in the chain of events through which an infection of animals adapts to become a problem for humans.

In 2012, the programme's success was recognised with further funding from the School that broadened the number of senior scientists involved and also brought a sharp focus on the problem of how best to treat the chronic viral infections HIV and hepatitis C. The primary vision of a cross-disciplinary effort harnessing mathematics and biomedicine remained in place.

The team's successes have been many and diverse and include: calculating how fast HIV evolves to escape from host immunity; discovering that HIV is evolving to be less deadly; bringing a vaccine against hepatitis C to a successful phase I clinical trial. In every example, practical progress has been driven by deep scientific understanding of the interplay between the infection and the host – particularly the host's immune response.

With maths and medicine, from theory to practice, the Institute for Emerging Infections and the programme on Chronic Viral Infections have worked together to enact James Martin's vision of combining and focusing the skills of people from many disciplines upon one of the most pressing problems of our times.

*Angela McLean is Professor of Mathematical Biology, Co-Director of the Institute for Emerging Infections, and Co-Director of the Oxford Martin Programme on Collective Responsibility for Infectious Disease.*



# MAKING MORE POSSIBLE

Oxford Martin School investments are designed to encourage teams to leverage further funding from diverse sources.

The School's investment in early stage projects provides critical proof of concept support, allowing researchers to refine and enhance their ideas. We provide an incubator and then support teams in building sustainable funding models. This approach has proved highly successful; many of the projects that the School created have become independent research institutes and operate on a scale that far exceeds the original establishment of the team.

Among the many examples of successful leverage of our initial investment are the International Migration Institute, the Plants for the 21st Century Institute and the Institute for New Economic Thinking at the Oxford Martin School.

The International Migration Institute was established in 2005 with funding from the Oxford Martin School. Subsequently it has matured into an independent research centre within the University, in a short period of time becoming the leading

centre on the study of the interface between international migration and development.

The Plants for the 21st Century Institute now has 14 funders, growing well beyond the initial dependence on funding from the School.

The early success of the Programme in Economic Modelling (created in 2010 from James Martin and Open Society Foundation funding), enabled the School to secure a larger award in 2012 from the Institute of New Economic Thinking in New York. The Institute for New Economic Thinking at the Oxford Martin School now has six research programmes (including Economic Modelling) and more than 70 affiliated scholars. It receives support from INET New York, the Open Society Foundation and over a dozen other philanthropic, government and corporate funders.

## INDEPENDENT INSTITUTE

Many of the projects that the School created operate on a scale that far exceeds the original establishment of the team.

## EARLY PROJECT

As pressure on land use increases across the globe, better research is needed into what land we can safely use for cultivation, how to improve crop yields and how to protect vital forested areas.



# PLANTS FOR THE 21ST CENTURY

## PROFESSOR LIAM DOLAN

Traditionally, researchers worked in academic silos that prevented us from seeing above and beyond our own immediate projects to see the connections between crops, conservation and forestry. And yet, joining up those dots is vital if society is to use land in a way that will maximise crop outputs while at the same time protecting 'hotspots' of species diversity.

With support from the Oxford Martin School, in 2010 we created the Plants for the 21st Century Institute. It put a focus on applying our science to generate scientific resources and information for policy makers, conservation biologists, multinational companies and farmers.

Oxford Martin funding supports two particular areas of research. The first is BRAHM, a database of 'hotspots' that are rich in rare species, with local detail on hitherto uncultivated plants. The database informs decisions on the selection of areas for conservation or for sustainable economic development, and is currently used extensively in Brazil, New Zealand and South Africa.

The second area funded by the School looks at how to enhance root efficiency to improve the uptake of nutrients. The majority of fertiliser applied to fields is wasted, with only 10-30% of phosphate fertiliser taken up by crops; the rest simply runs off or forms insoluble salts in the soil. Research in this area is now at field trial stage.

Our research is on rice but has potential to provide valuable information for wheat and barley too.

It is not just the direct funding that has made support from the Oxford Martin School so valuable. Its support has helped leverage contributions from 14 other funders, giving the Institute a sustainable future.

*Liam Dolan is Sherardian Professor of Botany, Head of Plant Sciences, and Director of the Plants for the 21st Century Institute.*





# INTERNATIONAL MIGRATION INSTITUTE

## Co-Directors

### Oliver Bakewell

Associate Professor in the  
Department of International  
Development

### Hein de Haas

[until 2015]  
Former Associate Professor  
in Migration Studies and  
now Chair of Sociology,  
University of Amsterdam

**The causes of migration and their consequences in origin societies are essential to understanding how future global economic, social, technological and environmental change will affect human mobility.**



## Overview

**Challenge:** The movement of people has always played a central role in global processes of social, economic and political change. As international migration becomes more complex, it raises new intellectual and practical challenges for humanity.

**Ambition:** To provide an understanding of who is migrating, where to, why, and what impacts these movements have on both receiving countries and origin societies.

**Approach:** In 2005, funding from the Oxford Martin School helped to set up the International Migration Institute, based at the Department of International Development. An interdisciplinary team, IMI investigates the ways in which human mobility is changing. It sees migration as part of broader global change, instead of holding the traditional 'receiving country' bias.

## Progress

IMI's unique and groundbreaking macro-level and survey databases on migration flows and migration policies allow for enhanced empirical insights on the long-term drivers and consequences of global migration. These databases represent the most comprehensive collection of international migration flow data to date and have resulted in collaborations with the World Bank and OECD (Organisation for Economic Co-operation and Development). IMI research has also generated important insights into the effectiveness of migration policies.

IMI has developed a Migration Scenario Methodology, which has been adopted by governments, academic institutions and NGOs in Europe, North Africa, the Horn of Africa and the Pacific to explore how future development processes will affect migration.

IMI has become a world leader in the research and analysis of African migration, specialising in mobility within the continent, where its expertise is sought by state officials and donors, as well as international organisations.

IMI engages with a range of international organisations to deliver insights and resources on migration. These include the International Labour Organisation (ILO), the International Organization for Migration (IOM), the World Bank, OECD, the European Commission and networks such as the European Migration Network, and Metropolis. For example, it has been an active participant in ongoing debates on how the global Sustainable Development Goals can best take account of mobility.

IMI has been instrumental in establishing the MSc Migration Studies in Oxford, which is helping to train the next generation of migration scholars and practitioners in its distinctive multidisciplinary and critical approach to the analysis of migration. Graduates of this programme are now working in many of these international organisations.



# INSTITUTE FOR NEW ECONOMIC THINKING AT THE OXFORD MARTIN SCHOOL

**Executive Director**  
**Eric Beinhocker**

**Programme Directors**

**Complexity Economics:**

**J. Doyne Farmer**  
Professor of Mathematics

**Curriculum Development:**

**Wendy Carlin**  
Professor of Economics, UCL

**Economic Modelling:**

**Sir David Hendry**  
Professor of Economics

**John Muellbauer**  
Professor of Economics

**Economics of Sustainability:**

**Cameron Hepburn**  
Professor of Environmental Economics

**Employment, Equity & Growth:**

**Brian Nolan**  
Professor of Social Policy

**Ethics & Economics:**

**David Vines**  
Professor of Economics

## Overview

**Challenge:** In the wake of the 2008 global financial crisis, and with society facing challenges ranging from growing economic inequality to the threat of climate change, we need new insights into how the economy really works and how it might be made to work better.

**Ambition:** To work closely with policy makers and leaders in business and civil society to bring new economic ideas and thinking into debates and practice in the public, private and non-profit sectors.

**Approach:** INET Oxford's multidisciplinary teams are applying leading-edge tools from the social and physical sciences to problems including financial system stability, economic growth, inequality, poverty reduction and environmental sustainability.

With eight research areas and six programmes, the scope of INET Oxford is far larger than we can report here. INET Oxford's own detailed report on 2012-2014 is available online.

## Progress

Professor Doyne Farmer led Project CRISIS, which developed agent-based models of the economy to be used by central banks and governments to support policy development and analysis. INET Oxford collaborated with 10 research units across Europe and with policy makers from central banks and intergovernmental institutions.



In 2012 Professor Sir Tony Atkinson and Salvatore Morelli published *The Chartbook of Inequality*, a concise review of the broad forces behind the long-term trend towards inequality. The data indicate that inequality is growing and that we should expect even higher levels unless the prevailing economic policies and structures change. The data are being used to inform thinking about inequality worldwide.

Launched in 2014, the Employment, Equity and Growth programme, led by Professor Brian Nolan, is investigating why growth has failed to deliver for 'middle-income and below' working households, and which policy and institutional responses might produce a better, fairer growth model.

The Economics of Sustainability Programme, led by Professor Cameron Hepburn, is developing new ways to account for natural capital, measure wealth creation, stimulate green technology innovation, and assess climate and economic risk. The programme examines the

behavioural shifts and institutional innovations needed to transition to a sustainable economy.

Led by Professor Wendy Carlin of University College London and INET Oxford, the CORE project aims to update the undergraduate economics curriculum and how it is delivered, in order to make economics both more relevant and more accessible. More than 20 leading economists from around the world helped to create an online textbook – *The Economy* – for a new introductory economics course, which launched in autumn term 2014.

The Economic Modelling Programme, led by Professor Sir David Hendry, aims to develop new methods of economic analysis and forecasting that can take account of abrupt changes in economies. The team's models are receiving widespread interest and as a result they have engaged with organisations including: the central banks of Argentina, Australia, Austria, Brazil, Canada, Cyprus, England, Greece, South Africa, Sweden, and Switzerland; US Federal Reserve Board, European Central Bank, World Bank, IMF, Bank for International Settlements, Statistics Norway and Statistics South Africa.

## Potential

A more realistic and empirically-based understanding of the economy could have a broad and positive impact on society by helping leaders in government, business, and the social sector make better decisions on a host of critical issues.



# IDEAS INTO ACTION

Underpinning all our research is the need to translate academic excellence into impact - from innovations in science, medicine and technology, through to policy recommendations and consultations.

ACADEMIC  
EXCELLENCE



SCIENCE

POLICY

TECHNOLOGY

MEDICINE



IMPACT

The Oxford Martin School faculty has demonstrated a strong record in informing approaches to significant global policy issues.

Our experts are engaged with numerous international agencies and activities, advise multinational businesses and are involved in policy formulation in many countries worldwide.

Over the next few pages, we give an overview of just a small sample of the impact our work has made, starting with the School's own policy initiatives.

# OXFORD MARTIN COMMISSION FOR FUTURE GENERATIONS

1M

1M ONLINE VIEWS

171

IN 171 COUNTRIES

34

SHOWN AT 34 EVENTS



Tackling major global challenges requires a long-term perspective, yet politics and business operate on short-term horizons.

In response, in 2012 we established the Oxford Martin Commission for Future Generations. The Commission is a group of 19 international leaders from government, business, academia, media and civil society, working to address the growing short-term preoccupations of modern politics and business. The Commission is chaired by Pascal Lamy, the former Director-General of the World Trade Organization.

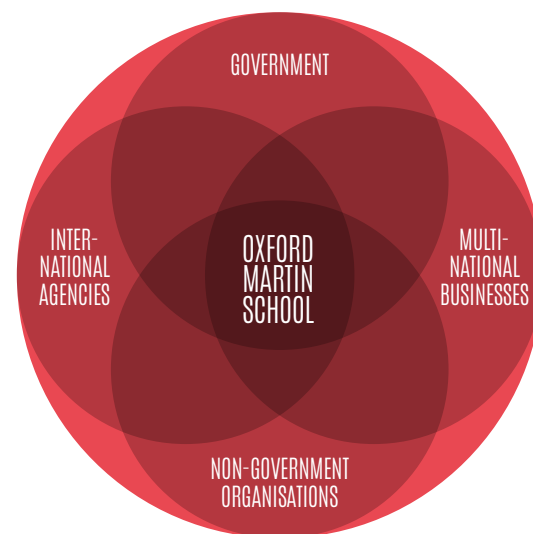
Reporting in October 2013, the Oxford Martin Commission for Future Generations' report, **Now for the Long Term**, proposed 15 practical recommendations aimed at creating a better world for future generations. It has been accessed online in 171 countries more than one million times, has been showcased at 34 events across the world, and it has been presented to and endorsed by a range of world leaders.

The Commission's work did not stop with the report's publication. The School continues to push forward recommendations from **Now for the Long Term**.





Oxford Martin School academics work with international agencies, advise multinational businesses and are involved in policy formulation in many countries.



## COLLABORATION AND PARTNERSHIP

A number of our teams are actively involved in tackling climate change and their expertise has been called upon by the Intergovernmental Panel on Climate Change, the UNFCCC and other international organisations engaged in combatting climate change.

Meanwhile, our emerging infections group provided advice to the World Health Organization and our Institute for New Economic Thinking has been working with central banks and financial regulators in a number of countries to improve global financial stability. In the United Kingdom, Oxford Martin School academics regularly provide expert testimony to parliamentary hearings and advise the Prime Minister and cabinet members on strategic science and technology policy issues.

The Oxford Martin School aims to have an impact beyond academia and we actively facilitate introductions

for our scholars with business and political leaders, as well as with civil servants and others. Our activities go beyond seminars and lectures, to more systematic approaches supporting the interaction between our academics and those outside the University.

For example, our academics have advised international policy makers such as the Strategic Futures Group of the US National Intelligence Council; the Strategy, Policy and Review Department of the International Monetary Fund; and the South African National Planning Commission.

The World Economic Forum has provided another avenue for the discussion and dissemination of our work. Our partnership with the World Economic Forum covers a number of dimensions, including its Global Risks Report, for which we regularly host consultations with Oxford Martin School experts. In addition, since

2008, our researchers have delivered more than 60 presentations on global challenges to world leaders at the World Economic Forum's annual Davos and China meetings.

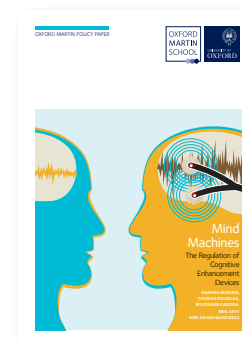
### Restatements

It is vital that policy makers are able to access and understand complex scientific evidence, particularly in controversial areas.

Oxford Martin School Restatements review the natural science evidence base underlying areas of current policy concern and controversy. Written in policy neutral terms and designed to be read by an informed but not technically specialist audience, restatements are produced by a writing team reflecting the breadth of opinion on the topic in the science community and involve wide consultation with interested stakeholders.

## OXFORD MARTIN POLICY PAPERS

In 2014, we initiated a series of policy papers written by Oxford Martin School researchers. These papers are designed to draw on Oxford Martin School research to synthesise a key policy issue and recommend specific actions to government, business and civil society.



**Mind Machines: The Regulation of Cognitive Enhancement Devices** looks at the increasing popularity of cognitive enhancement devices (CEDs) for non-medical purposes, such as gaming and 'brain-training'. Current European legislation subjects these devices to nothing more than basic product safety requirements, despite them directly modifying the electrical activity of the brain. **Mind Machines** proposes a regulatory model to help oversee this expanding industry. Its authors are currently pursuing the possibility of the inclusion of CEDs in the EU Medical Devices Directive. As a result of this work, the lead author, Dr Hannah Maslen, has been co-opted as a member of the Horizon Scanning Special Interest Group, part of the European Commission's New and Emerging Technologies Working Group.



**Robo-Wars: The Regulation of Robotic Weapons** urges governments to recognise the increasing prominence of robotic weapons in contemporary and future forms of warfare, and proposes steps towards suitable regulation.

The report's authors, Dr Alex Leveringhaus and Dr Gilles Giacca, give a clear and concise overview of the technological dimensions of these weapons, as well as their treatment under existing international legal and ethical frameworks. It assesses the regulatory options currently under discussion, and recommends ways for states, manufacturers and the military to develop a suitable framework. The authors and the School are working to disseminate the policy paper and its findings to UN and Whitehall audiences.



**Short-lived Promise? The Science and Policy of Cumulative and Short-Lived Climate Pollutants** clarifies the difference between CO<sub>2</sub> and short-lived climate pollutants (SLCPs), such as methane, in the fight to tackle climate change. The paper was issued in spring 2015 to help inform policy makers working ahead of the UNFCCC COP21 meeting in Paris.

The report's author, Professor Myles Allen, explains that reducing SLCP emissions is beneficial in the short to medium term but unless efforts to cut CO<sub>2</sub> emissions are introduced first or at the same time, SLCP reductions will not help to limit peak warming.



# OXFORD MARTIN PROGRAMME ON SOLAR ENERGY

£8M

SECURED IN MARCH 2015  
TO ACCELERATE FULL-  
SCALE PRODUCTION AND  
DEPLOYMENT.

## Co-Directors

**Alain Goriely**

Professor of Mathematical Modelling

**Henry Snaith**

Professor in Physics

**This approach could provide a low cost, highly efficient alternative to silicon solar cells, which can be incorporated into windows.**



## Overview

**Challenge:** With increasing industrialisation and a growing population, energy demands will continue to grow. Faced with adverse climate change, the search for a viable source of renewable energy is ongoing. Solar energy is one of the most promising sources. At present, the photovoltaic market is dominated by solar cells made of crystalline silicon. This team is looking at a more efficient and cost-effective solution.

**Ambition:** To transform the profile of solar power and energy generation through the commercialisation of the perovskite solar cell.

**Approach:** In 2013, Professor Henry Snaith's group demonstrated that perovskite has remarkable photovoltaic properties. The components are cheap and abundant, but perovskite proved a difficult material to work with. A new approach brought together mathematical modelling and physical experiments to create perovskite photovoltaic cells.

## Progress

The joint team found the optimum thickness for exactly the right degree

of transparency for perovskite film, as well as the correct temperature at which to heat and harden the film, and the optimum duration of heating.

Further research identified the key mechanisms responsible for the electronic properties of perovskites and helped identify new materials that are likely to make good semiconductors.

The result was the creation of thin-film perovskite solar cells, which can be printed directly onto solar cells or glass, and which improves voltage and efficiency of solar cells.

In March 2015, the commercial spin-off, Oxford Photovoltaics, secured £8m to accelerate full-scale production and deployment.

## Potential

This approach could provide a low cost, highly efficient alternative to silicon solar cells, which can be incorporated into windows.

Once integrated into the glazing units of a building, the technology is capable of providing a significant percentage of the building's electrical energy requirements directly from sunlight.





# OXFORD MARTIN PROGRAMME ON HUMAN RIGHTS FOR FUTURE GENERATIONS



## Co-Directors

### Dapo Akande

Professor of Public International Law

### Simon Caney

Professor of Political Theory

### Sandra Fredman

Rhodes Professor of the Laws of the British Commonwealth and the United States



Challenges such as poverty, environmental change and armed conflict require international co-operation on an unprecedented scale.

## Overview

**Challenge:** Challenges such as poverty, environmental change and armed conflict require international co-operation on an unprecedented scale. Our actions on these issues will affect the welfare of future generations and those who do not have a voice. Yet there are serious questions regarding the adequacy of existing frameworks to face these challenges.

**Ambition:** To advance a new human rights framework built on ethical, legal and political dimensions that will help translate theory into policy.

**Approach:** Our unique collaboration of experts in law, politics and ethics considers the ways in which ethical dilemmas can be translated into real legal and policy solutions, taking into account resources, demographic and geographic population change and facilitating dialogue between academics, governments, international institutions, charities and NGOs.

## Progress

Led by Professor Akande, the team has worked closely with the United Nations Special Rapporteur on extrajudicial, summary or arbitrary executions. This includes a joint meeting and research that informed the report on **Drones, Targeted Killings and the Right to Life**, presented by the Special Rapporteur to the United Nations General Assembly at its 68th session in October 2013.

The team is one of the partners for a pioneering project by the Welsh Government developing ways in which nations can embed a long-term perspective into political processes. This has resulted in The Well-being of Future Generations Act, designed to ensure that Welsh public bodies take into account the long-term impact of their decisions.

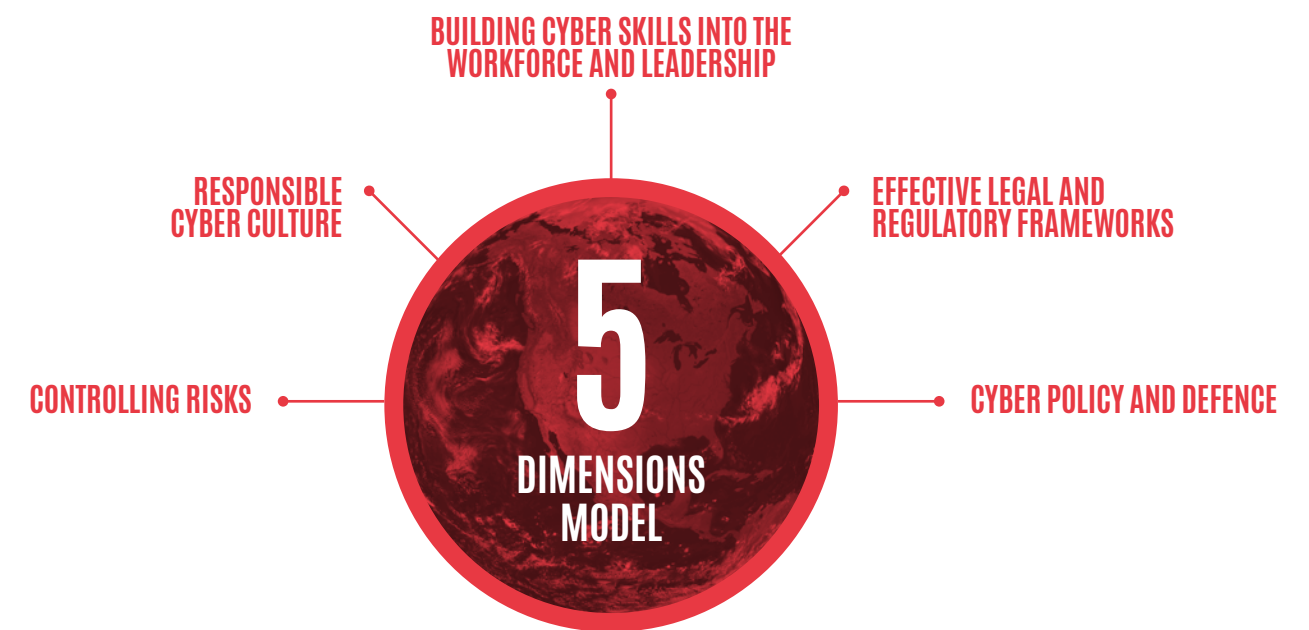
Researchers have been working with counterparts at Peking University to establish a global dialogue on China's role in global climate policy.

Professor Caney was a Contributing Author to **Climate Change 2014: Mitigation of Climate Change**. This was the contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

Professor Fredman has contributed to two influential UN reports: **Discrimination against Women in Economic and Social Life** for the United Nations Working Group on Discrimination against Women in Law and Practice (a paper on 'The Role of Equality and Non-Discrimination Laws in Women's economic participation: formal and informal'); and **Progress of the World's Women 2014 – Making the Economy Work for Women** for UN Women (a paper on 'Gender Equality and Human Rights').



# GLOBAL CYBER SECURITY CAPACITY CENTRE



## Overview

**Challenge:** Cyberspace is a global resource that offers opportunities for prosperity, and carries substantial risks to security and human rights. Countries have vastly different levels of capacity to manage cyberspace.

The scale and speed of capacity building therefore need to increase dramatically to ensure that growth and innovation in cyberspace supports the wellbeing, human rights and prosperity of all, and not just those organisations and nations that are already ahead.

**Ambition:** To increase cyber capacity globally by providing a framework that enables countries to assess their existing and potential capacity; and to help identify investment and policy priorities to enhance safety and security in cyberspace, while respecting values such as privacy and freedom of expression.

**Approach:** The Centre combines research with practical deployment of its model, in a framework that can be applied across the world. The research that underpins the model focuses on five dimensions – cyber policy and defence; responsible cyber culture; building cyber skills into the workforce and leadership; effective legal and regulatory frameworks; and controlling risks.

## Progress

The team has developed a cybersecurity maturity model based on the five dimensions, which allows individual countries to identify what capacity they already have to manage cyberspace. The model helps nations to benchmark themselves, plan cyber security strategies, and to set priorities for capacity development. Working with key stakeholders, the Centre has successfully begun to apply the model across the international community.

The team is working with the World Bank to apply the model with member nations, in order to assess current capacity and to identify priorities for the future. So far the team has worked with the governments of Armenia, Bhutan, Kosovo and Montenegro, and other missions are in prospect. Cybersecurity assessments underpinned by the Centre's model are now being incorporated into the Bank's initial planning phases for significant ICT investments around the world.

The Centre is working in partnership with the Organization of American States, under the auspices of their collaboration with the Inter-American Development Bank, to map existing levels of cyber security capacity in Latin America and the Caribbean.

The mapping is being used to develop region-wide strategies for cybersecurity.

Working with the Commonwealth Telecommunications Organisation, the model is also underpinning a needs assessment of cyber capacity in support of strategy development in a number of Commonwealth countries, starting with Uganda and Botswana.

A new and complementary model is being developed by the Centre, which looks at the harm that might be experienced as a result of cyber-attacks. This will sit alongside the maturity model in a framework to help nations assess investment and policy priorities.

## Potential

By providing a framework that all nations can adopt, more regions in the world will be better placed to harness the opportunities that cyberspace offers, while being better able to deal with risks and threats to cyber security.

### Director

**Sadie Creese**  
Professor of Cybersecurity



# FUTURE DIRECTIONS

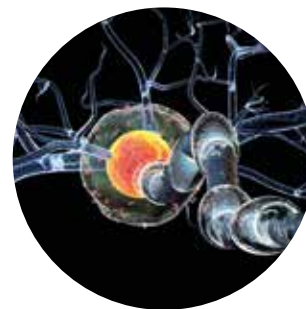
## RESEARCH PRIORITIES

From 2015, we are developing programmes under a new research theme each year. Working with the research programme Directors, Management Committee and Policy and Research Steering Group, we annually identify the most pressing research questions and actively seek new approaches to them. We expect to fund up to three new research projects each year, for up to five years each.



# GLOBAL COMMONS, COLLECTIVE RESPONSIBILITIES AND MARKET FAILURES

Under our theme for 2015, four programmes received funding to provide fresh insights into how to manage the global commons, the issues surrounding collective responsibilities and possible responses to market failures.



INFECTIOUS  
DISEASE



INTEGRATING  
RENEWABLES

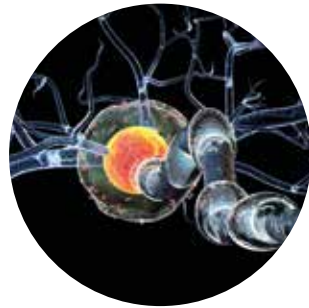


SUSTAINABLE  
OCEANS



CARBON  
INVESTMENT





### Co-Directors

#### Mark Harrison

Director of the Wellcome Unit for the History of Medicine and Professor of the History of Medicine

#### Angela McLean

Professor of Mathematical Biology

#### Julian Savulescu

Uehiro Professor in Practical Ethics

## OXFORD MARTIN PROGRAMME ON COLLECTIVE RESPONSIBILITY FOR INFECTIOUS DISEASE

Infectious diseases are the biggest killer of children and young people. However, our ability to tackle them is being undermined by drug resistance, growing rates of vaccine refusal and disease transmission across a globalised air transport system.

Policies to control infectious diseases must take collective responsibility seriously. To do this, we need to pay attention to human choice and behaviour.

We require behavioural change.

The programme will examine the 'human factor' in infectious diseases - the role of behaviour, psychology, and ethics. It brings together history, paediatrics, philosophy, psychology and zoology, to focus on influenza, malaria, antibiotic resistance and vaccine-preventable childhood infections.



### Co-Directors

#### Nick Eyre

Associate Professor in the Environmental Change Institute and Jackson Senior Research Fellow in Energy

#### Malcolm McCulloch

Associate Professor in Engineering Science

## OXFORD MARTIN PROGRAMME ON INTEGRATING RENEWABLE ENERGY

Energy supply is responsible for 65% of greenhouse gas emissions, and transition to a low carbon energy system is critical to mitigating climate change. Intermittent renewable energy sources will play a key role, mainly through a large contribution to electricity generation.

The technical approaches to accommodating intermittency are excess generation capacity, demand flexibility, energy storage and grid inter-connection. However, electricity markets currently provide insufficient incentives for capacity, flexibility and innovation; therefore a rethink of regulatory, market and institutional arrangements is required.

This programme aims to deliver a framework for understanding technical, market and policy requirements for integrating renewables across a wide range of scales and contexts.

The programme brings together an interdisciplinary team of eight experts on energy issues, from five University of Oxford departments, and has practical support from key industrial and government organisations.



### Co-Directors

#### Alex Rogers

Professor of Conservation Biology

#### Richard Bailey

Associate Professor in Geochronology

## OXFORD MARTIN PROGRAMME ON SUSTAINABLE OCEANS

The largest ecosystem on earth, the global ocean, is on a path of serious decline, driven by collective mismanagement. The window of opportunity to change course is shrinking as exploitation of marine resources accelerates.

The programme aims to provide policy and research tools for effective governance, based on sound science, and the ability to monitor and assess the impact of human activities. It aims to guide the exploitation of marine resources toward sustainable management.

Experts from marine science, law and computing will look to resolve legal barriers to progress in sustainable ocean management.



### Co-Directors

#### Myles Allen

Professor of Geosystem Science

#### Cameron Hepburn

Professor of Environmental Economics

## OXFORD MARTIN SAFE CARBON INVESTMENT INITIATIVE

There is overwhelming evidence that continued accumulation of carbon dioxide in the atmosphere will eventually lead to dangerous changes in the climate. Stabilising global temperatures requires net carbon dioxide emissions to be reduced to zero. Getting to net zero emissions will require dramatic changes in investments and in energy systems. How should investors, the ultimate owners of potentially stranded fossil fuel assets, respond?

Many large investors have divested from coal or are attempting to divest from all fossil fuels. Others argue that divestment is not as effective as active engagement with the fossil fuel industry.

The Oxford Martin School, in collaboration with Harvard and Columbia Universities, is consulting with investment and fossil fuel industry stakeholders, to devise a set of actionable investment principles that will provide a framework for constructive engagement. This aims to allow both investors and the industry to play their part in securing critical reductions in CO<sub>2</sub> emissions.



# RESEARCH PARTNERSHIPS

We work with a wide range of partners to identify new research questions of global significance, and to ensure that our thinking reaches the widest possible audience.

In 2014, we forged a new long-term partnership with Citi. We publish joint reports that bring the work of the School to Citi's global network, increasing the extent and diversity of people we reach, and fostering collaboration between Oxford Martin School academics and Citi's research teams. Citi is supporting a new research programme on the impact of technology on employment and on society, which was launched at the beginning of 2015.

## THE OXFORD MARTIN PROGRAMME ON TECHNOLOGY AND EMPLOYMENT

### Co-Directors

#### Dr Carl Benedikt Frey

Oxford Martin Citi Fellow

#### Michael Osborne

Associate Professor in Machine Learning

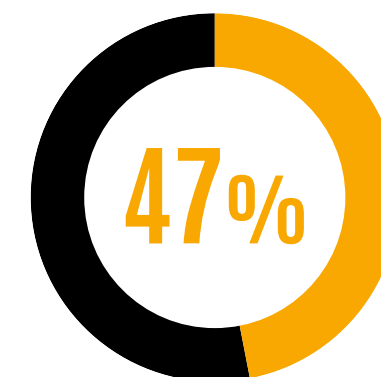
This programme investigates the implications of a rapidly changing technological landscape for economies and societies.

The programme will provide an in-depth understanding of how technology is transforming the economy, to help leaders create a successful transition into new ways of working in the 21st century.

The programme will provide novel and relevant evidence on:

- How technology is transforming companies and industries;
- Why some places are better at adapting to this transformation;
- Related implications for living standards, inequality and social mobility.

Research already published by the programme revealed that up to 47% of US jobs are at risk of automation over the next two decades, including up to 87% of jobs in Accommodation and Food Services, and up to 54% in Finance and Insurance.



OF US JOBS MIGHT BE AT RISK OF AUTOMATION OVER THE NEXT TWO DECADES

## NEW VISITING FELLOWS PROGRAMME



In late 2014, we established a new Visiting Fellows Programme. The emphasis is on the impact of the visitor on our programmes' research and it is therefore open to people from all kinds of backgrounds, such as business and government, as well as academia.

The flexibility is proving popular, as it gives our research teams the opportunity to invite leading figures to Oxford, to bring new perspectives and to act as a catalyst for change.



# A PLATFORM FOR DEBATE AND ENGAGEMENT

An essential part of our mission is to engage with external audiences, to influence decision makers and also to meet the public demand for information on the big issues we address.

**20,000**  
ATTENDEES

**180**  
EVENTS

**450**  
VIDEOS

**10 YEARS**



PROF. AMARTYA SEN



ELON MUSK



GARRY KASPAROV



AL GORE



BARONESS HELENA  
KENNEDY



DAME SALLY DAVIES

In ten years, we have welcomed over 20,000 attendees to more than 180 Oxford Martin School seminars, lectures, talks and panel discussions. Our speakers are leading thinkers from academia, politics, global governance and NGOs. They include renowned figures such as the Nobel Prize winners Professors Amartya Sen, John Sulstan and Joseph Stiglitz; Elon Musk, Garry Kasparov, Al Gore, Baroness Helena Kennedy, Dame Sally Davies, George Soros, Thomas L. Friedman, Mohamed El-Erian, Martin Rees and many others.



## PARTNERSHIPS PROVIDE A VALUABLE MEANS TO INCREASE THE RANGE AND SCALE OF OUR IMPACT. WE COLLABORATE WITH A WIDE RANGE OF LOCAL, NATIONAL AND INTERNATIONAL GROUPS



Partnerships provide a valuable means to increase the range and scale of our impact. We collaborate with a wide range of local, national and international groups, including the How To Academy, Intelligence Squared, NESTA, Policy Exchange, Virgin Unite, Vodafone, the World Economic Forum, and World 50.

In Oxford, we are the Festival Ideas Partner for The FT Weekend Oxford

Literary Festival, opening our doors to more than 4,000 people at 70 events in 10 days each spring. We also work closely with student organisations such as the Oxford International Relations Society, 21CC and Altius, to ensure that students have access to Oxford Martin School experts at conferences and debates.

For those who cannot attend our events, we have more than 450 videos online. Over 300 are viewed each month. Our

video of Elon Musk's talk on the future of transport, for example, has been watched by more than 30,000 people.

Our academics are regularly called upon to provide expert opinion in media the world over, with upwards of ten media citations a week contributing to public understanding of complex global issues.

**Since October 2013, the Oxford Martin School has occupied the renovated Old Indian Institute building in the heart of Oxford.**

Our permanent home is the hub of the School and provides our research teams – who are housed in offices and labs across Oxford – with shared resources and a central locus for joint activity.

Our lecture theatre, seminar rooms, meeting rooms and Illy Café are well-utilised by research teams as a venue for team events, conferences and workshops.





# FINANCES

The Oxford Martin School has raised and invested £50m in research programmes (2005-2015), which has helped researchers leverage a further £184m.

£50M

£184  
MILLION  
A 268% LEVERAGE

The School's research is supported by a diverse range of organisations around the world, including governments, research councils, philanthropists, corporations and charitable foundations.

# PEOPLE

## Management Committee

The Management Committee has executive responsibility for managing the overall strategy of the School, including oversight of the School's research funding and academic accountability of its research programmes. It comprises the Heads of each of the four divisions of the University of Oxford, an additional representative from the Chair's division, the Pro-Vice-Chancellor of Research and the School's Director. The current Chair is Professor Roger Goodman, Head of the Social Sciences Division.

## Advisory Council

The Advisory Council brings an international focus and experience from a broad range of sectors to the School's research agenda and public engagement strategies. The Council provides valuable advice and ongoing support to the School, especially through the annual meeting in Oxford.

### Current Advisory Council members are:

**Larry Brilliant**  
Founding President, Skoll Global Threats Fund

**Victor Chu**  
Chairman, First Eastern Investment Group

**Vittorio Colao**  
Chief Executive, Vodafone Group

**Francis Finlay**  
Chairman Emeritus, EastWest Institute, New York

**Orit Gadiesh**  
Chairman, Bain & Co

**Ian Goldin (ex-officio)**  
Director, Oxford Martin School

**Ben Goldsmith**  
Chief Executive Officer, Menhaden Capital and Founding Partner, WHEB Group

**Roger Goodman (ex-officio)**  
Head of Social Sciences Division, University of Oxford, and Chair of the Management Committee for the Oxford Martin School

**Zaha Hadid**  
Dame, Founding Director, Zaha Hadid Architects

**Andrew Hamilton**  
Vice-Chancellor, University of Oxford, and Chair of the Advisory Council

**Reid Hoffman**  
Executive Chairman and Co-Founder, LinkedIn

**Mo Ibrahim**  
Founder, Mo Ibrahim Foundation

**Pascal Lamy**  
Former Director-General, World Trade Organization

**Amory Lovins**  
Co-founder, Chairman & Chief Scientist, Rocky Mountain Institute

**Trevor Manuel**  
Former Minister, Republic of South Africa

**Lillian Martin**  
Oxford Martin School

**Julia Marton-Lefèvre**  
Former Director-General, International Union for Conservation of Nature (IUCN)

**Nandan Nilekani**  
Former Chairman, Unique Identification Authority of India; former CEO, Infosys

**Joseph Nye**  
Professor & former Dean, Harvard Kennedy School

**Ngozi Okonjo-Iweala**  
Former Minister of Finance, Nigeria and Former Managing Director, World Bank

**Peter Piot**  
Director, London School of Hygiene & Tropical Medicine; former Executive Director, UNAIDS

**Martin Rees (Lord Rees of Ludlow)**  
Former President of the Royal Society, and Emeritus Fellow of Trinity College, University of Cambridge

**Amartya Sen**  
Nobel Laureate, and Professor, Harvard University

**Mark Shuttleworth**  
IT entrepreneur and Founder of the Ubuntu Project

**Sir Martin Sorrell**  
Chief Executive, WPP

**Nicholas Stern (Lord Stern of Brentford)**  
President, British Academy; IG Patel Professor of Economics and Government, London School of Economics

**Joseph Stiglitz**  
Nobel Laureate, and Professor, Columbia University

**HRH Prince Talal Bin Muhammad**  
Prince of Jordan

**Sir Crispin Tickell**  
Former Ambassador to the United Nations

**Laurence Tubiana**  
Founder, Institute of Sustainable Development and International Relations

**J. Craig Venter**  
Chairman, J Craig Venter Institute

**Ernesto Zedillo**  
Director, Yale Center for the Study of Globalization; former President of Mexico

## Programmes and Institutes

Programmes, current or most recent directors, and start and end dates (where programmes have finished) of Oxford Martin School funding.

**21st Century Ocean Institute (2008-2012)** Professor Gideon Henderson, Professor David Marshall

**Biodiversity Institute (2009-)** Dr Nathalie Seddon

**Climate Policy Group at the Environment Change Institute (2005-2008)**

Professor Diana Liverman

**e-Horizons Institute (2005-2009)** Professor William Dutton  
Professor Paul Jeffreys

**Future of Humanity Institute (2005-2012)** Professor Nick Bostrom

**George Institute for Global Health (2010-)**

Professor Stephen MacMahon, Professor Robyn Norton (Principal Directors), Professor Terry Dwyer (Executive Director), Professor Kazem Rahimi (Deputy Director)

**Global Cyber Security Capacity Centre (2013-)** Professor Sadie Creese

**Institute for Carbon and Energy Reduction in Transport (2008-2013)** Professor David Banister, Professor Malcolm McCulloch

**Institute for Emerging Infections (including Clearing Chronic Viral Infections Programme) (2005-)** Professor Angela McLean, Dr John Frater (from 2015), Professor Rodney Phillips (until 2015)

**Institute for New Economic Thinking at the Oxford Martin School (2012-)** Eric Beinhocker

**Institute for Science and Ethics (previously Programme on the Ethics of Biosciences) (2005-2012)** Professor Julian Savulescu

**Institute for Science, Innovation and Society (2005-)**

Dr Javier Lezaun  
Professor Steve Rayner

**Institute for the Future of Computing (2010-2014)**

Professor David de Roure  
Professor Bill Roscoe

**Institute for the Future of the Mind (2005-2011)** Baroness Susan Greenfield

**International Migration Institute (2005-)**

Dr Oliver Bakewell  
Professor Hein de Haas (until 2015)

**Oxford Centre for Tropical Forests (2008-)**

Professor Yadvinder Malhi

**Oxford Geoengineering Programme (2010-)**

Professor Myles Allen  
Professor Richard Darton  
Professor Steve Rayner  
Professor Catherine Redgwell  
Professor Julian Savulescu

**Oxford Institute for Ethics, Law and Armed Conflict (2008-2013)**

Professor Dapo Akande  
Dr David Rodin  
Professor Jennifer Welsh

**Oxford Institute for Global Economic Development (2010-)**

Professor Sir Paul Collier  
Professor Anthony Venables

**Oxford Institute of Population Ageing (2005-)**

Professor Sarah Harper  
Professor George Leeson

**Oxford Martin Programme in Nuclear and Energy Materials (2010-)**

Professor Chris Grovenor  
Professor James Marrow

**Oxford Martin Programme on Bio-Inspired Quantum Technologies (2012-)**

Professor Dieter Jaksch  
Professor Vlatko Vedral



**Oxford Martin Programme on Collective Responsibility for Infectious Disease (2015-)**  
Professor Mark Harrison  
Professor Angela McLean  
Professor Julian Savulescu

**Oxford Martin Programme on Complexity, Risk and Resilience (2013-)**  
Dr Felix Reed-Tsochas

**Oxford Martin Programme on Human Rights for Future Generations (2013-)**  
Professor Dapo Akande  
Professor Simon Caney  
Professor Sandra Fredman

**Oxford Martin Programme on Integrating Renewable Energy (2015-)**  
Professor Nick Eyre  
Professor Malcolm McCulloch

**Oxford Martin Programme on Mind and Machine (2010-)**  
Professor Jonathan Flint  
Professor Gero Miesenböck  
Professor Scott Waddell

**Oxford Martin Programme on Nanotechnology (incorporating the Institute of Nanoscience for Medicine) (2008-2013)**  
Dr Sonia Contera  
Dr Sonia Trigueros

**Oxford Martin Programme on Resource Stewardship (2012-)**  
Professor Myles Allen  
Professor Jim Hall  
Professor Steve Rayner  
Professor Kathy Willis

**Oxford Martin Programme on Sustainable Oceans (2015-)**  
Dr Richard Bailey  
Professor Alex Rogers

**Oxford Martin Programme on Technology and Employment (2015-)**  
Dr Carl Benedikt Frey  
Professor Michael Osborne

**Oxford Martin Programme on the Future of Food (2011-)**  
Professor Charles Godfray

**Oxford Martin Programme on the Impacts of Future Technology (2011-)**  
Professor Nick Bostrom

**Oxford Martin Programme on Vaccines (2010-)**  
Professor Adrian Hill  
Professor Susan Lea  
Professor Andrew Pollard  
Professor Christoph Tang

**Oxford Martin Safe Carbon Investment Initiative (2015-)**  
Professor Myles Allen  
Professor Cameron Hepburn

**Oxford Stem Cell Institute (2008-)**  
Dr Paul Fairchild  
Professor Colin Goding

**Particle Therapy Cancer Research Institute (2008-2012)**  
Professor Ken Peach  
Professor Bleddyn Jones

**Plants for the 21st Century Institute (2010-)**  
Professor Liam Dolan  
**Programme for the Future of Cities (2009-)**  
Professor Michael Keith  
Professor Steve Rayner

**Programme on Computational Cosmology (2010-)**  
Professor Pedro Ferreira  
Professor Chris Lintott (until 2014)

**Programme on Globalising Tidal Power Generation (2010-2015)**  
Professor Guy Houlsby  
Dr Richard Willden

**Programme on Modelling and Predicting Climate Change (2010-2015)**  
Professor Tim Palmer

**Programme on Solar Energy: Organic Photovoltaics (2010-2015)**  
Professor Alain Goriely  
Professor Henry Snaith

**World Education Institute (2005-2008)**  
Dr Tom Benson  
Professor Angus Hawkins

## Academic researchers

In addition to directors, each institute or programme has principal investigators, research fellows, associate fellows and visiting fellows. Listed here are past and current members, not all of whom have received direct funding from the Oxford Martin School or funding partners. Not listed here are the many hundreds of doctoral students who have been part of these programmes.

None of this work would be possible without the dedication of the support and administrative staff who are a vital part of these programmes. Our thanks go to all of them.

Dr Isabella Aboderin  
Professor Samson Abramsky  
Dr Robert Ackland  
Dr Michele Acuto  
Dr Ioannis Agrafiotis  
Dr Javier Agusti  
Professor Colin Akerman  
Professor Jeffrey Almond  
Dr David Alonso  
Dr Wilfried Altzinger  
Dr Facundo Alvaredo  
Dr Karen Anderton  
Dr Arzhang Ardavan  
Professor John Armour  
Dr Wes Armour  
Dr Stuart Armstrong  
Dr Janine Aron  
Professor Ivan Arreguin-Toft  
Professor Sir Tony Atkinson  
Dr Colin Axon  
Professor Robert Axtell  
Professor Tipu Aziz  
Dr Adam Babbs  
Dr Maria Bada  
Dr Paola Ballon-Fernandez  
Dr René Banares-Alcántara  
Dr Idalina Baptista  
Professor Gunnar Bardsen  
Selim Barhli  
Dr Ellie Barnes  
Professor Simon Batterbury  
Dr Esther Becker

Dr Nick Beckstead  
Dr Rob Bellamy  
Dr Clarissa Belloni  
Dr Simon Benjamin  
Dr Vanessa Berenguer-Rico  
Dr Tamara Berthoud  
Dr Emanuela Bianchera  
Dr Naluwembe Binaisa  
Dr Justin Bishop  
Dr Jason Blackstock  
Dr Marko Blažeković  
Dr Mick Blowfield  
Dr Konstantin Blyus  
Professor John Boardman  
Dr Olaf Bochmann  
Dr Cherie Bond  
Ayla Bonfiglio  
Dr David Bonilla  
Dr Line Bonneau  
Professor Michael Bonsall  
Professor Alistair Borthwick  
Dr David Boshier  
Dr Heather Bouman  
Dr Emily Boyd  
Dr Max Boykoff  
Julien Brachet  
Professor Andrew Briggs  
Dr Ian Brown  
Professor Peter Bruce  
Dr Erzsebet Bukodi  
Dr Victor Burlakov  
Lars Börjesson  
Dr Fabio Caccioli  
Professor Zameel Cader  
Joseph Caesar  
Dr Igor Calzada  
Robert Camilleri  
Dr Adam Candy  
Dr Lee Carpenter  
Professor Andrew Carr  
Dr Carolyn Carr  
Dr Ernesto Carrella  
Dr Annamaria Carusi  
Professor Alessandra Casarico  
Dr Jennifer Castle  
Professor Stephen Castles  
Dr Chris Caswell  
Dr Ana Cehovin  
Dr Tracey Chantler  
Ali Chaudhary  
Dr Chinchì Chen  
Dr Robert Chen  
Dr Tarek Cheniti  
Dr Stephen Clarke  
Professor Kieran Clarke  
Professor Michael Clements  
Dr Gari Clifford  
Dr Elizabeth Clutterbuck  
Dr Lauren Coad  
Professor Bob Coecke  
Professor Robin Cohen  
Dr David Coles  
Dr Claudio Consul  
Guinevere Cooper  
Professor Paul Cornish  
Dr Matt Cottingham  
Dr Owen Cotton-Barratt  
Dr Sally Cowley  
Professor Molly Crockett  
Dr Mark Crockett  
Dr Deborah Cromer  
Dr Sven Crone  
Professor ZhanFeng Cui  
Dr Mathias Czaika  
Professor Jan Czernuszka  
Dr Sarah Darby  
Dr Peter Darrah  
Dr Gaurav Das  
Dr Romola Davenport  
Professor Paul David  
Dr William Davies  
Dr Grace de la Flor  
Dr Nicola De Maio  
Dr Philip de Whalley  
Dr Matthijs Den-Besten

Professor David Deutsch  
Dr Ian Devonshire  
Dr Daniel Dewey  
Dr Catherine Dolan  
Dr Christina Dold  
Dr Eleanor Dommett  
Dr Jurgen Doornik  
Dr Erwin Dotzauer  
Dr Tom Douglas  
Dr Eric Drexler  
Dr James Duffy  
Dr Joanna Dunkley  
Brian Earp  
Professor Timo Ehring  
Dr Esther Eidinow  
Dr Karin Eli  
Dr Barzoo Eliassi  
Professor Neil Ericsson  
Dr Alexandre Erler  
Dr Evelyn Ersanilli  
Dr Owain Evans  
Dr Nadira Faber  
Dr Andrew Farlow  
Professor Doyné Farmer  
Dr Chris Farmer  
Dr Tristan Farrow  
Professor Rosario Fazio  
Dr Javier Fernandez-Macho  
Dr Elena Fiddian-Qasmiyeh  
Denis Filer  
Marie-Laurence Flahaux  
Dr Helen Fletcher  
Dr Grace de la Flor  
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Professor David Frame  
Dr John Frater  
Dr Daniel Fricke  
Lorena Fricke  
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Dr Helen Fryer  
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Dr Alan Gamlen  
Professor Javier Garcia Martinez  
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Dr Tara Garnett  
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Dr Liang Chen  
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Dr Ben Gidley  
Professor Sarah Gilbert  
Dr Michael Gilmont  
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Davide Girolami  
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Dr Daniel Gutknecht  
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Professor Tony Hall  
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Dr Roger Hammersland  
Dr Pak Hang Wong  
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Dr Clare Hayward

Dr Peter Healey  
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Dr Robin Hickman  
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Dr Amy Hinterberger  
Professor Andreas Hoff  
Ariel Hoffman  
Dr Jaco Hoffman  
Dr Craig Holmes  
David Hope  
Dr Marieke van Houte  
Mr Kenneth Howse  
Dr Xin Huang  
Dr Anna-Maria Hubert  
Dr Wolf Huetteroth  
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Dr Pam Hurley  
Dr Mildred Iro  
Professor Molly Jahn  
Professor William James  
Professor Paul Jarvis  
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Andrew Liddell  
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Professor Björn-Ola Linnér

Dr Jianguo Liu  
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Professor Patricia Longstaff  
Dr Eduardo Lopez  
Dr Ana Lopez  
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Professor John Mackay  
Professor Robert MacLaren  
Mika Mahosenaho  
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Dr Eric Mandelbaum  
Ulf Mannervik  
Shane Mansfield  
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Dr Nils Markusson  
Dr Noortje Marres  
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Dr Natalie G Martin  
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Dr Pallab Maulik  
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Dr Helen McDermott  
Dr Linsey McGoey  
Professor Steve McKeever  
Dr Travers McLeod  
Dr Hugh McNamara  
Professor Desmond McNeill  
Professor Helen McShane  
Professor Neil Mendy  
Richard Millar  
Professor Chris Mitchell  
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Dr Amin Moghaddam  
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Taylor Roberts  
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Professor M. Angela Sasse  
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Dr Pete Scarborough  
Professor Hans Schellnhuber  
Dr Christian Schilling  
Dr Tanya Schneider  
Dr Robert Schreiber  
Professor Ralph Schroeder  
Dr Heike Schroeder  
Dr Robert Scotland  
Professor John Selsky  
Professor Len Seymour  
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Dr Serena Sharma  
Bill Sharpe  
Dr Jonathan Sharples  
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