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# Oxford Martin School

Tackling the challenges of the 21st century



## Welcome

**Professor Ian Goldin**, *Director, Oxford Martin School;*  
*Professor of Globalisation and Development, University of Oxford*

The Oxford Martin School is a unique interdisciplinary research initiative at the University of Oxford. We bring together leading academics from diverse intellectual backgrounds to find practical and scalable solutions to some of the biggest challenges confronting humanity.

We live in a hyper-connected world of accelerating change. Citizens and decision makers are navigating a complex landscape in which choices made today will have long-term ramifications. By providing fresh insights, our researchers are both informing those choices and delivering answers to some of the toughest challenges ahead.

Through a highly competitive and selective process, we have created over 35 interdisciplinary institutes and programmes in the Oxford Martin School

that draw together leading researchers from medical, physical and social sciences, as well as the humanities. All our teams are located in Oxford; a number of our research teams are based at our iconic building in the heart of Oxford.

Our aim is to be a catalyst for ideas. We bring together an active and engaged community of scholars who are defined by their excellence and shared desire to work outside disciplinary silos in order to address the most pressing challenges of our time. Our research projects range from preserving the world's biodiversity to understanding the human brain and decision making. We are harnessing the power of citizen science in the study of large, complex datasets; and developing cutting-edge technologies to facilitate new

solutions. Examples include innovative approaches to developing vaccines for malaria, enhanced root systems for drought resistant crops, and nano-scale drug delivery systems for targeting cancer cells. Our integrative work on systemic risk and complexity, as well as on globalisation and governance, draws on multiple research groups and disciplines from across the School.

Our research aims to provide decision makers with the understanding they need to make the right choices in addressing key global economic, social and environmental challenges. We recognise that our success depends on our relevance and ability to distil and communicate our ideas. To this end, we look forward to your engagement with us.



**“In our near future we can expect extreme and diverse paradigm shifts, enabled by technology and driven by many factors. Oxford Martin School research is playing a vital role in devising powerful ways to deal with the complex challenges humanity faces.”**

**James Martin** (1933-2013), *Founder, Oxford Martin School*

## About the Oxford Martin School

Part of the University of Oxford, the Oxford Martin School is an interdisciplinary research community of over 300 scholars, working to harness the opportunities of the 21st century and to address its most pressing challenges.

From the governance of geo-engineering and the possibilities of nanotechnology, to the future of food and the implications of our ageing population, the Oxford Martin School supports Oxford-based research teams to consider some of the biggest questions that concern our future.

Founded in 2005 through the vision and generosity of Dr James Martin, the Oxford Martin School has grown into a global centre for interdisciplinary scholarship.

Our research is helping to anticipate the consequences of our collective actions, and to influence policy and behaviour globally. It is supported by a small core team of professionals who work to facilitate collaborative activity, foster public engagement, and translate and transmit ideas to influential audiences.

## Oxford Martin Commission for Future Generations

“Only rarely is a report of a high-profile commission smart, readable, bold, thoughtful, analytically tough, and actionable. And on an issue that is fundamental to our shared humanity: acting now to secure our children’s future.”

**Nancy Birdsall**, *President, Center for Global Development*

“Now for the Long Term is an excellent contribution to the debate on how to tackle the problem of short-termism. This insightful report makes it clear that the challenges facing businesses and governments require long-term thinking and leadership.”

**Dominic Barton**, *Worldwide Managing Director, McKinsey & Company*

Failure to address long-term issues exposes current generations to unacceptable instability and risk; it threatens our ability to build a sustainable, inclusive and resilient future for all. Time and again, key economic, climate, trade, security and other negotiations reach an impasse with little progress made. Politicians fail to work beyond election terms and business leaders are caught in short-term reporting cycles. Decision-making for the long term fails to take priority.

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

In October 2013, the Oxford Martin Commission for Future Generations launched its report **Now for the Long Term**. The report analyses the issues and the megatrends that underpin them; examines the lessons from past successes and failures; proposes a set of principles to overcome deep political and cultural divides; and provides practical recommendations for action on critical challenges.

**Now for the Long Term** draws on the latest analysis of global best practice, the experience and knowledge of the Commissioners, and the wide-ranging expertise of scholars associated with the Oxford Martin School.

Within the first four months of its launch, **Now for the Long Term** was downloaded more than 800,000 times, in over 160 countries, demonstrating the appetite for fresh thinking in these debates.

Events to discuss and deliberate the key findings and recommendations have taken place in the U.S., Asia and Europe, with further activities planned throughout the year.

Commissioners have shared the findings and recommendations with leaders such as Ban Ki-moon, UN Secretary General; Herman van Rompuy, President of the European Council; and Christine Lagarde, Managing Director of the IMF. The Commissioners continue to engage with governments, businesses, NGOs and civil society in order to take the recommendations forward.

To keep up to date with the latest developments from the Oxford Martin Commission for Future Generations, visit: [www.oxfordmartin.ox.ac.uk/commission](http://www.oxfordmartin.ox.ac.uk/commission), where you can find a live blog detailing the latest events and discussions, as well as downloads and videos on the key topics.

### Commissioners:

**Chair: Pascal Lamy**, former Director-General, World Trade Organization

**Michelle Bachelet**, President of Chile

**Lionel Barber**, Editor, Financial Times

**Roland Berger**, Chairman, Roland Berger Strategy Consultants

**Ian Goldin**, Director, Oxford Martin School; Professor of Globalisation and Development, University of Oxford (Vice-Chair of the Commission)

**Arianna Huffington**, President and Editor-in-Chief, Huffington Post Media Group

**Mo Ibrahim**, Chair of the Board, Mo Ibrahim Foundation

**Luiz Felipe Lampreia**, former Minister of Foreign Affairs, Brazil

**Liu He**, Minister, Office of the Central Leading Group on

Financial and Economic Affairs, People’s Republic of China

**Kishore Mahbubani**, Dean and Professor in the Practice of Public Policy, Lee Kuan Yew School of Public Policy, National University of Singapore

**Trevor Manuel**, Minister and Chair of the National Planning Commission, South Africa

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

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

**Chris Patten (Lord Patten of Barnes)**, Chancellor, University of Oxford; Chairman, BBC Trust

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

**Martin Rees (Lord Rees of Ludlow)**, former President, the

Royal Society; Fellow of Trinity College, University of Cambridge

**Amartya Sen**, Nobel Laureate and Thomas W. Lamont University Professor, and Professor of Economics and Philosophy, Harvard University

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

**Jean-Claude Trichet**, former President, European Central Bank

# Oxford Martin School Research Teams

OXFORD  
MARTIN  
SCHOOL

## Technology & Society

- Economic Modelling
- Cities
- Global Cyber Security Capacity Centre
- Economic Development
- Computing
- Future Technology
- Complexity, Risk and Resilience
- Migration
- New Economics
- Quantum Technology
- Computational Cosmology
- Science & Society
- Ageing Populations

## Ethics & Governance

- Human Rights
- Ethics & Economics
- Armed Conflict
- Geoengineering
- Humanity's Future
- Resource Stewardship
- Employment, Equity & Growth

## Energy & Environment

- Science & Ethics
- Biodiversity
- Food
- Nuclear Materials
- Plants
- Solar Energy
- Tidal Power
- Tropical Forests
- Climate Change

## Health & Medicine

- Emerging Infections
- Healthcare Innovation
- Mind
- Nanomedicine
- Stem Cells
- Vaccines



“We often know what the solutions are to these tough global questions. What we lack is the will to do something about them. Through its ground-breaking interdisciplinary scholarship and innovative approach to cross-cutting partnership, the Oxford Martin School is generating the solutions and, importantly, putting them into action.”

**Chris Patten (Lord Patten of Barnes)**, *Chancellor, University of Oxford; Chairman, BBC Trust; member of the Oxford Martin Commission for Future Generations*

“The complex challenges of our century require researchers to work across multiple disciplines in new and creative ways; politically, the results of this research need to have a real impact on the way we live. The Oxford Martin School is dedicated to working on both these fronts.”

**Professor Sir John Beddington CMG FRS**, *Senior Adviser, Oxford Martin School, and former UK Government Chief Scientific Adviser*

## How we work

We cover four core themes: health and medicine; energy and environment; technology and society; and ethics and governance. Our strength lies in our ability to bring individuals from different disciplines together to work in teams which interrogate complex and globally significant challenges.

The School selects its teams through a highly competitive process and measures performance against four criteria:



### 1. Scale and Significance

Is the research topic of global scale and future significance?



### 2. Academic Excellence

Are the people involved the best in their field, through past achievements and future potential?



### 3. Impact

Will this research make a major positive difference in the world outside academia and how will this be achieved?



### 4. Value Add

What is innovative about this research; how is it interdisciplinary; could the research be undertaken elsewhere; and, how will it add value to the School's overall aims?

## AGEING POPULATIONS

### Oxford Institute of Population Ageing

*Director:*

*Professor Sarah Harper, Professor of Gerontology*

Over the next fifty years, the age composition of nearly every country is expected to move to one in which the old outnumber the young. We are seeing a fundamental shift in the demographic structure of society. This is historically unprecedented and will require significant changes to many of our institutions, from education to pensions. We investigate the wide-ranging impacts brought about by the global decline in fertility and late life mortality, which is driving this age compositional change, and make policy recommendations for how government, business and society can respond.

## ARMED CONFLICT

### Oxford Institute for Ethics, Law and Armed Conflict

*Directors:*

*Dapo Akande, University Lecturer in Public International Law*

*Dr David Rodin, Senior Research Fellow in Philosophy*

*Professor Jennifer Welsh, Professor of International Relations*

The 20th century was by far the bloodiest in human history. What might the 21st century have in store if we do not reconsider the ways we manage conflict? We have brought together expertise in ethics, law and international politics to reassess how the world governs armed conflict. Our work helps establish ethical principles at the foundations of international decision-making, from the use of precision munitions such as armed drones, to the global governance of nuclear weapons. We aim to determine how more authoritative structures and decision-making mechanisms can be created for the management and reduction of conflict.

## BIODIVERSITY

### Biodiversity Institute

*Directors:*

*Dr Nathalie Seddon, Royal Society University Research Fellow*

*Professor Kathy Willis, Tasso Leventis Chair in Biodiversity*

Biodiversity is vital to the planet's life support system and provides the basic natural services – water, food, air – on which humans depend. However, climate change and human impacts are bringing biodiversity to a crisis point beyond which it may be impossible to replenish species or repair ecosystems. We have created a strong interdisciplinary research collaboration, both to advance the science of biodiversity and to develop the frameworks, structures and novel technologies to implement this science into management and policy. Our focus on biodiversity beyond protected areas and our integration of new technologies will help businesses and society develop best practices to conserve biodiverse ecosystems into the next century.

## CITIES

### Oxford Programme for the Future of Cities

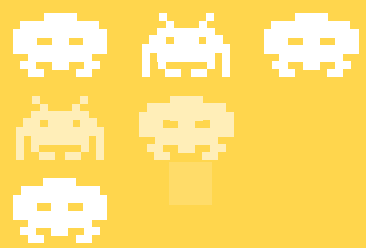
*Directors:*

*Professor Michael Keith, Professor in Anthropology*

*Professor Steve Rayner, James Martin Professor of Science and Civilization*

Cities all over the world face complex and rapidly evolving challenges, such as climate change, global migration flows, transnational governance demands, financial volatility and expanding social inequalities. Addressing these challenges requires ingenuity and versatility, whether in policy making, investment decisions or daily life. Our focus on the 'flexible city' provides a new way of thinking about urban change. Our aim is to advance innovation in decision-making and help find more effective policies and governance structures that will enable cities to respond to evolving circumstances.

# CAN WE ELIMINATE THE PROSPECT OF CYBER ATTACK?



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## CLIMATE CHANGE

**Programme on Modelling and Predicting Climate**

*Directors:*  
*Dr Chris Farmer, Research Fellow in Applied Mathematics*  
*Professor Tim Palmer, Royal Society Research Professor in Climate Physics*

Climate predictions are used for making major decisions in climate mitigation, adaptation and geoengineering. The quality of a decision depends on the accuracy of the forecasts and how well the uncertainty in the forecast can be estimated. We bring advanced mathematical modelling techniques to develop new and better understandings of climate dynamics and atmospheric physics. We play an active role in informing global debate and advancing the field of climate science by developing improved modelling methods for weather and climate prediction.

## COMPUTATIONAL COSMOLOGY

**Programme on Computational Cosmology**

*Directors:*  
*Professor Pedro Ferreira, Professor of Astrophysics*

Throughout most of scientific history, the speed at which we added to our knowledge of the universe was limited by the amount of data available. Science in the 21st century is fundamentally different. Advances in technology provide an unprecedented wealth of information to researchers. We are a team of astrophysicists who recognise that the tools and technologies we are developing to map the skies can be used in many other fields of analysis. Our focus is on enhancing collaboration across disciplines and sharing methodologies that will accelerate progress in fields as diverse as oceanography, climate science and humanitarian aid.

## COMPLEXITY, RISK AND RESILIENCE

**Oxford Martin Programme on Complexity, Risk and Resilience**

*Director:*  
*Dr Felix Reed-Tsochas, James Martin Lecturer in Complex Systems*

The study of complex networks provides a powerful perspective on the spread of social and technological innovation, and the resilience of critical infrastructure in biological, financial, social, and engineered systems. By combining network approaches with methods like agent-based modelling, we seek to understand how systems evolve and respond to changing environments. The research brings together a multi-disciplinary group from more than 10 University of Oxford departments, ranging from the physical, biological and computational sciences to the social, economic and political sciences. A large component of this research, conducted through the Programme on Complexity Economics, is hosted by INET Oxford.

## COMPUTING

**Institute for the Future of Computing**

*Directors:*  
*Sadie Creese, Professor of Cyber Security*  
*Professor David De Roure, Professor of e-Research*  
*Professor Bill Roscoe, Professor of Computing Science*

We research computing in the 21st century, specifically the increasing ubiquity and accelerating speed of computers, dealing with the massive increase of digital data, and developing usable, secure network systems.

We help accelerate research through the development of innovative computational and information technology in multidisciplinary collaborations. Our initiatives include developing energy efficient algorithms, novel methodologies for design, technologies for reasoning across large-scale data, and secure mechanisms for computer networking and data transfer.

“Fresh thinking in economics is urgently needed to mitigate many global challenges, not least systemic financial crises, the creation of sustainable jobs and employment, and the wide-ranging challenges of development. That is why I am supporting research at the Institute for New Economic Thinking at the Oxford Martin School (INET Oxford).”

**George Soros**, *Chairman, Soros Fund Management and Co-Founder, INET Oxford*

“Being part of the Martin School has encouraged us to think on the broadest possible scales, to consider the impact of our work far beyond the ‘home’ discipline of astrophysics and to collaborate with some wildly interesting people. For example, the Oxford Martin School’s connections have been critical in pushing us to develop the potential humanitarian uses of technology first developed to find exploding stars.”

**Chris Lintott**, *former Director, Oxford Martin Programme on Computational Cosmology*

## CYBER SECURITY

### Global Cyber Security Capacity Centre

*Director:*

*Professor Sadie Creese,  
Professor of Cyber Security*

Global cyber security is a crucial capability to underpin growth and innovation in the digital economy. This centre, funded by the UK government, focuses on helping the international community increase the impact, scale and pace of building capacity. It is developing a framework for understanding what works, what doesn’t work and why, so that governments and enterprises can adopt policies and make investments that have the potential to enhance security in cyberspace. The Centre’s work comprises five dimensions: cyber policy & cyber defence; responsible cyber culture; building cyber skills into the workforce & leadership; and creating effective legal and regulatory frameworks.

## ECONOMIC DEVELOPMENT

### Oxford Institute for Global Economic Development

*Directors:*

*Professor Sir Paul Collier CBE,  
Professor of Economics*

*Professor Anthony Venables,  
BP Professor of Economics*

Although the last 20 years have seen an unprecedented fall in global poverty, inequality remains an urgent issue in countries that have been left behind. We are improving understanding of why some regions have successfully increased participation in the world economy while others have not. We are actively involved in informing international policy debates around development challenges, and helping to implement successful strategies that will raise the opportunities for low-income countries currently left behind.

## EMERGING INFECTIONS

### Institute for Emerging Infections

*Directors:*

*Professor Angela McLean, Professor  
of Mathematical Biology*

*Professor Rodney Phillips,  
Professor of Clinical Medicine*

New infections are still a threat to humanity. They are impossible to prevent and hard to predict. If we can understand the underlying processes that drive the emergence and spread of human infectious diseases, we take an important step towards mitigating their most devastating impacts. We use both experimental and modelling work to learn how viruses evolve and infect, with the aim of developing timely and effective strategies to prevent further infections. We expanded in 2012 with new funding from the Oxford Martin School to use the latest genome sequencing technologies to develop individually-tailored therapies that can clear – or sustainably suppress – chronic viral infections, such as hepatitis C and HIV.

## FOOD

### Oxford Martin Programme on the Future of Food

*Director:*

*Professor Charles Godfray,  
Hope Professor of Zoology*

Without radical change to the way we produce and consume food, as well as to the governance of the food system, there is a substantial risk of significant increases in food prices with major political, environmental and humanitarian consequences. We aim to bring both fresh insights and effective action to address the challenges of feeding the global population sustainably, healthily and equitably. To achieve this, we work closely with academia, government, civil society and the private sector, to develop new scientific and policy approaches to critical issues concerning demand, supply and governance in the global food system.

## FUTURE TECHNOLOGY

### Oxford Martin Programme on the Impacts of Future Technology

*Director:*

*Professor Nick Bostrom,  
Professor of Philosophy*

As the rate of technological innovation accelerates, it is vital to understand the nature of technological change, its directions and potential for humanity. We take a long-term view of the future, aiming to understand the impacts of breakthroughs in potentially transformative technologies such as computing, artificial intelligence, nanotechnology and surveillance technologies. By examining the technological capabilities that might be attained, we can gain an understanding of the implications for society and the consequences of present trajectories.

## GEOENGINEERING

### Oxford Geoengineering Programme

*Directors:*

*Professor Richard Darton,  
Professor of Engineering Science*

*Professor Steve Rayner, James Martin  
Professor of Science and Civilization*

*Professor Julian Savulescu, Uehiro  
Professor in Practical Ethics*

Geoengineering is the deliberate, large-scale intervention in the Earth’s natural systems to address climate change. Although society’s first priority should be to reduce global carbon emissions, we may need to consider geoengineering technologies to reduce the harmful effects of elevated levels of carbon dioxide in the atmosphere. We combine scientific research into the practical application and scalability of proposed solutions with explorations of the ethical implications of technological deployment. We aim to provide governance solutions through robust research on the ethical, legal, social and geopolitical implications of a range of geoengineering approaches.

# WHAT WILL CITIES OF THE FUTURE BE LIKE?



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Migration Institute  
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Oxford Programme for  
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Oxford  
Institute of  
Population  
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## HEALTHCARE INNOVATION

### George Centre for Healthcare Innovation

Directors:

*Professor Stephen MacMahon,  
Professor of Medicine*  
*Professor Robyn Norton,  
Professor of Public Health*

In this decade more than 120 million people will die before the age of 60 from chronic diseases, such as heart diseases and cancers. Road traffic injuries will kill another 20 million and disable many more. We are working to develop novel strategies for managing disease, injury and disability, with a focus on regions of the world where health and social services are ill-equipped to deal with these challenges, in particular India and China. Our approach is two-pronged: research on the evaluation and implementation of practical, affordable models of care delivery; and development of investment-ready, low-cost technologies to increase access to effective treatments for major chronic diseases.

## HUMAN RIGHTS

### Oxford Martin Programme on Human Rights for Future Generations

Directors:

*Dapo Akande, University Lecturer  
in Public International Law*  
*Professor Simon Caney,  
Professor in Political Theory*  
*Professor 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. Our actions on these issues will affect the welfare of future generations. There are serious questions regarding the adequacy of existing frameworks to face these challenges. We have formed a unique collaboration of experts in law, politics and ethics to consider the ways in which ethical dilemmas can be translated into robust legal and policy solutions. We aim to inform the development of a global governance framework for resource allocation and institutional regulation in which justice and human rights play a fundamental role.

## HUMANITY'S FUTURE

### Future of Humanity Institute

Director:

*Professor Nick Bostrom,  
Professor of Philosophy*

No-one can know what the future will hold, but through our research, we consider how society might deal with different future scenarios, and ideally avoid some of them. We examine a range of potential global risks, from nuclear war to worldwide tyrannies, pandemic infections, cosmic hazards and economic collapse.

With a team of leading intellects from philosophy, mathematics, economics and physics, we aim to develop more informed, reflective and responsible ways of dealing with global threats in order to positively shape humanity's long-term future.

## MIGRATION

### International Migration Institute

Directors:

*Dr Oliver Bakewell, Senior  
Researcher, Oxford Department  
of International Development*  
*Dr Hein de Haas, University  
Lecturer, Oxford Department of  
International Development*

The movement of people has always played a central role in social, economic and political change. However, policy makers and researchers are ill-prepared for future migration trends primarily because of a limited insight into the factors driving human mobility and how such factors affect the global migration map. We pioneer new theoretical and methodological approaches, working with researchers and policy makers in the global South and North. We approach migration as an intrinsic part of broader global transformation processes rather than a problem to be solved. Our work aims to inform policies that can fully realise the potential benefits of migration for individuals and societies.



## MIND

### Programme on Mind and Machine

Directors:

*Professor Jonathan Flint, Professor of Molecular Psychiatry*

*Professor Gero Miesenböck, Waynflete Professor of Physiology*

*Professor Scott Waddell, Professor of Neurobiology*

Advances in understanding how the brain works are rapidly leading to new possibilities for intervention in brain function. The ability of brains and machines to talk directly to each other is fast becoming a possibility. We are pioneering the field of optogenetics, which involves the genetic modification of nerve cells in the brain to respond to light. We bring together a collaboration of biologists, engineers and computer scientists to work on developing and applying this technology that allows the observation of and intervention in brain function. While advancing science, we are also addressing the profound ethical, legal and social issues related to understanding behaviour and potentially manipulating it.

## NANOMEDICINE

### Institute of Nanoscience for Medicine

Directors:

*Dr Sonia Contera, University Lecturer in Biological Physics and Nanomedicine*

*Dr Sonia Trigueros, Research Fellow in Biological Physics*

Nanotechnology has the potential to revolutionise the way we detect and treat trauma and disease. However, much work is needed to establish fundamental design principles and understand potential nano-toxicological effects before effective treatments can be developed. We are working at the interface of biology, physics, chemistry and engineering to create the tools to facilitate novel strategies for new treatments using nanostructures that target disease and promote healing.

## NEW ECONOMICS

### Institute for New Economic Thinking at Oxford (INET Oxford)

Director:

*Eric Beinhocker, Executive Director, INET Oxford*

Fresh economic thinking is needed on a number of critical challenges, ranging from managing systemic financial crises, to reinvigorating economic growth and

addressing rising inequality. INET Oxford provides new perspectives for economic analysis, empirical modelling and policy design to address the major challenges of the

global economic system. We aim to stimulate innovation and debate, support leading-edge interdisciplinary research, and redefine the education of the next generation of

economists, business people and government leaders.

### INET Oxford's programmes currently include:

## NUCLEAR MATERIALS

### Programme in Nuclear and Energy Materials

Directors:

*Professor Chris Grovenor, Professor of Materials*

*Professor James Marrow, James Martin Professor of Energy Materials*

Oil and gas are finite resources and many countries are turning to nuclear power to help solve the world's energy problems. The question about nuclear power has now become not if we should be using it but how we can ensure the next generation of nuclear power systems is demonstrably safer, proliferation resistant and efficient. We are building a world-class centre of research to understand the materials problems in nuclear power generation and to transmit our knowledge to key decision makers in policy and business.

## COMPLEXITY ECONOMICS

Directors:

*Professor J. Doyne Farmer, Professor of Mathematics*

Applying perspectives and tools from complex systems theory, network theory, reflexivity theory, and evolutionary theory to deepen our understanding of economic phenomena, including financial system stability and fragility, economic growth and innovation, environmental sustainability, and the management of systemic risk.

## ECONOMIC MODELLING

Directors:

*Professor Sir David Hendry, Professor of Economics*

*Professor Sir Tony Atkinson, Professor of Economics*

Researching the causes and consequences of the financial crisis, the impacts of shifts in inequality of income and wealth, flaws in mathematical tools underpinning neo-classical economics, and the development of new forecasting methods that are robust in the face of structural change.

## ETHICS AND ECONOMICS

Directors:

*Professor John Armour, Professor of Law and Finance*

*Professor David Vines, Professor of Economics*

Involving economists, philosophers, legal scholars, management researchers and policy experts to examine why financial institutions take such enormous risks, which are not always in the interest of their shareholders and clients, and why post-2008 the financial services industry is strongly resisting reforms that would constrain such risk-taking.

## EMPLOYMENT, EQUITY AND GROWTH

Acting Director:

*Professor John Muellbauer, Professor of Economics*

Identifying and assessing the economic theories, policies and institutional changes required for fairer, more inclusive growth, with a focus on creating sustainable jobs and reducing unemployment in a period of intensifying globalisation and technology change.

## CURRICULUM IN OPEN-SOURCE RESOURCES IN ECONOMICS (CORE)

Director:

*Wendy Carlin, Professor of Economics, UCL*

The (CORE) Project was set up in October 2013 to propose a new approach to economics teaching for undergraduates. The aim is to update the existing economics curriculum in the light of recent developments in economics, the economy and in teaching methods. CORE material will be created collaboratively, be disseminated via the internet, and be free to use by participating institutions.

# CAN WE PRESERVE OUR PRECIOUS NATURAL RESOURCES?



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Plants for the 21st  
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Oxford Martin  
Programme  
on Resource  
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Oxford Centre for  
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## PLANTS

### Plants for the 21st Century Institute

Director:  
Professor Liam Dolan, *Sherardian Professor of Botany*

Ensuring food and fuel security around the world in the 21st century is a major challenge that requires innovative research in plant sciences. We bring together three pinnacles of food security: improving crop production, promoting species conservation, and protecting forested land. Our research across the crop sciences will be able to tolerate drought, produce greater yields and resist disease. A key aim is to generate scientific resources and foster initiatives that will enable policy makers, conservation agencies, multinational companies and individuals to use land in the most sustainable and efficient way.

## QUANTUM TECHNOLOGY

### Oxford Martin Programme on Bio-Inspired Quantum Technologies

Directors:  
Professor Dieter Jaksch, *Professor of Physics*  
Professor Vlatko Vedral, *Professor of Quantum Information Science*

Quantum computing offers an as yet unfulfilled promise of making gigantic leaps in our data-processing capacity, and could lead to important benefits across all aspects of society. The greatest hurdle in the development of such technology is the extreme fragility of quantum memory. We are taking an innovative top-down perspective to learn from nature how certain biomolecules, such as those responsible for photosynthesis, are able to demonstrate quantum coherence. With our interdisciplinary team of physicists, material scientists, modellers and computer scientists, we are developing ways to replicate these properties and take the first steps to building a quantum computer.

## RESOURCE STEWARDSHIP

### Oxford Martin Programme on Resource Stewardship

Directors:  
Professor Myles Allen, *Professor of Geosystem Science*  
Professor Jim Hall, *Professor of Climate and Environmental Risks*  
Professor Steve Rayner, *James Martin Professor of Science and Civilization*  
Professor Kathy Willis, *Tasso Leventis Chair in Biodiversity*

Fresh water, land, atmosphere and biodiversity are universally vital resources subject to both cumulative and systemic pressures arising from human activities, which put them under severe degradation and even depletion. We have gathered a team of philosophers, anthropologists, economists, modellers and environmental scientists to re-think how we monitor, manage, maintain and allocate globally important resources. Our aim is to work through understandings of individual and collective behaviour and current institutional practice to deliver a new framework for stewardship that will ensure the world's essential resources remain available for generations to come.

## SCIENCE & ETHICS

### Institute for Science and Ethics

Director:  
Professor Julian Savulescu, *Uehiro Professor of Practical Ethics*

New and emerging sciences, such as those in stem cells, synthetic biology, artificial reproduction, the cognitive sciences and genomics, may radically and profoundly change human life. Without practical ethics, our knowledge of what we can do will radically outstrip our understanding of what we should do. The world's decision makers need to know if, how and under what circumstances we should place limits on research, development and use of these kinds of scientific advances. Our experts in medicine, philosophy, practical ethics, sociology and psychology are collating relevant evidence and applying philosophical methodology to analyse a range of ethical issues and help make recommendations for possible courses of action.

## SCIENCE & SOCIETY

### Institute for Science, Innovation and Society

Director:

Professor Steve Rayner, James Martin Professor of Science and Civilization

Advances in science and technology promise to bring solutions to a wide range of challenges faced by humanity, but they also raise difficult ethical, practical and governance questions that need addressing urgently. We bring fresh insights from cross-disciplinary approaches that question entrenched assumptions about how science, technology and society work. Our four core research programmes on cities, climate alternatives, bioproperty and neuromarketing share a common theme through exploring the role of science and values in shaping policy responses.

## SOLAR ENERGY

### Programme on Solar Energy: Organic Photovoltaics

Directors:

Professor Alain Goriely, Professor of Mathematical Modelling

Dr Henry Snaith, Reader in Physics

Solar energy technologies play an increasingly important role in our global power generation mix. To date, a key challenge has been in the need to bring down the cost and raise the efficiency of solar technologies. While organic solar cells are cheaper to produce, lighter and more flexible than traditional silicon-based solar cells, the problem of efficiency remains. Our collaboration between mathematical modelling and physical experiments is bringing new detail to the challenge, and will subsequently enable an acceleration in improvement of devices to ensure that solar energy makes the maximum contribution to society's energy budget.

## STEM CELLS

### Oxford Stem Cell Institute

Directors:

Dr Paul Fairchild, University Lecturer in the Immunobiology of Stem Cells

Professor Colin Goding, Professor of Oncology

Stem cells offer huge potential to replace diseased or worn out tissues and treat such illnesses as heart disease, Parkinson's and even diabetes. Yet there is still a great deal to learn about stem cells before we can fully harness their potential and apply these treatments in the clinic. We have created an internationally renowned centre of interdisciplinary expertise on stem cell science, fostering a network of scholars working on a broad range of technologies, from adult to embryonic stem cells, and from nuclear reprogramming to tissue engineering. Our work is helping to harness opportunities and accelerate innovation across the range of specialist expertise in stem cell research.

## TECHNOLOGY & EMPLOYMENT

### The Oxford Martin Programme on Technology & Employment

Directors:

Dr Carl Benedikt Frey, Oxford Martin Citi Fellow

Michael Osborne, Associate Professor in Machine Learning

Established in January 2015 with support from Citi, this programme has been created to investigate 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.

# CAN WE ELIMINATE ILLNESS & DISEASE?

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## TIDAL POWER

### Programme on Globalising Tidal Power Generation

Directors:

*Professor Guy Houlby, Professor of Civil Engineering*

*Dr Richard Willden, University Lecturer in Engineering Science*

Tidal power presents a huge, as yet untapped, opportunity to generate clean and affordable power. However, to harness fully the potential of tidal energy, there are many challenges to overcome, from infrastructure lock-in and regulatory hurdles to engineering obstacles. We examine how to make best use of this globally abundant supply of low-speed tidal flow resources, as well as carry out independent research on turbine mechanism and design. Our objective is to harness and deliver renewable power across the globe in a way that is both economic and scalable.

## TROPICAL FORESTS

### Oxford Centre for Tropical Forests

Director:

*Professor Yadvinder Malhi, Professor of Ecosystems Science*

Tropical forests are the greatest treasures of life on Earth, housing over half of all global biodiversity and providing numerous ecosystem services, including carbon and water cycles. We conduct fundamental research on the natural and social science of tropical forests and their governance, and foster a broad network of expertise across academics, NGOs and businesses to share knowledge and perspectives about the ecology, conservation and stewardship of forests around the world. We aim to understand the functioning and future prospects of tropical forests, and provide a resource for all those with a stake in their future.

## VACCINES

### Oxford Martin Programme on Vaccines

Directors:

*Professor Adrian Hill, Professor of Human Genetics*

*Professor Susan Lea, Professor of Chemical Pathology*

*Professor Andrew Pollard, Professor of Paediatric Infection and Immunity*

*Professor Christoph Tang, Glaxo Professor of Cellular Pathology*

Death from infectious diseases is a risk to many people and the threat of global pandemics continues to challenge vaccine research. We design and develop new vaccines against infectious diseases such as pandemic influenza, dengue, malaria, meningitis, typhoid and hepatitis C. In 2012, our programme expanded with funding from the Oxford Martin School to integrate improved vaccine design with new needle-free delivery technologies. Our research incorporates a broad range of disciplines that underpin modern vaccinology, from pathogen genomics to molecular biology to health economics, while also exploring the ethical frameworks.

## Past & Associate Members

The Oxford Martin School provides fixed term funding for innovative, future-oriented projects, either through establishing a new Institute or through developing a specific academic programme of research.

The following Institutes and Programmes have been supported by the School and remain affiliated through joint initiatives or related projects.

### 21st Century Oceans Institute:

combining computer modelling of ocean physics with the expertise of ocean chemistry to assess the ocean system's response to the changing carbon cycle.

**e-Horizons project** exploring and identifying how ICT-related breakthroughs might shape the future of communication in our increasingly networked society.

### Environmental Change Institute:

addressing how and why our environment is changing and how responses can be developed.

### Institute for Carbon and Energy

**Reduction in Transport:** examined the effectiveness of technical solutions in cutting greenhouse gases emitted by road transport.

### Institute for the Future of the Mind:

harnessing new technologies to maximise the potential of the mind at its most vulnerable, the young mind and the ageing mind.

## Who's Who at the Oxford Martin School

Director **Professor Ian Goldin**, Professor of Globalisation and Development, University of Oxford

### Advisory Council

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

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

**Vittorio Colao**, Chief Executive, Vodafone Group

**Francis Finlay**, Chair, James Martin 21st Century Foundation; Chairman Emeritus, EastWest Institute, New York

**Orit Gadiesh**, Chair, Bain & Co

**John Gage**, Co-Founder, Sun Microsystems

**Ben Goldsmith**, Founding Partner, WHEB Group

**Zaha Hadid**, 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**, Chair of the Board, Mo Ibrahim Foundation

**Pascal Lamy**, former Director General, World Trade Organization

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

Lillian Martin

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

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

**Ngozi Okonjo-Iweala**, Minister of Finance, Nigeria

**Martin Rees (Lord Rees of Ludlow)**, Astronomer Royal, former President of the Royal Society; Fellow of Trinity College, University of Cambridge

**Amartya Sen**, Professor, Harvard University

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

**Martin Sorrell (Sir)**, Chief Executive, WPP

**Nicholas Stern (Lord Stern of Brentford)**, Professor, London School of Economics

**Joseph Stiglitz**, Professor, Columbia University

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

**Crispin Tickell (Sir)**, former Director, Policy Foresight Programme

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

**Craig Venter**, President, J Craig Venter Institute

**Wang Enge**, President, Peking University

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

### Management Committee

**Professor Roger Goodman**, Head, Social Sciences Division (Chair of the Management Committee)

**Professor Alastair Buchan**, Head, Medical Sciences Division

**Professor Ian Goldin**, Director, Oxford Martin School

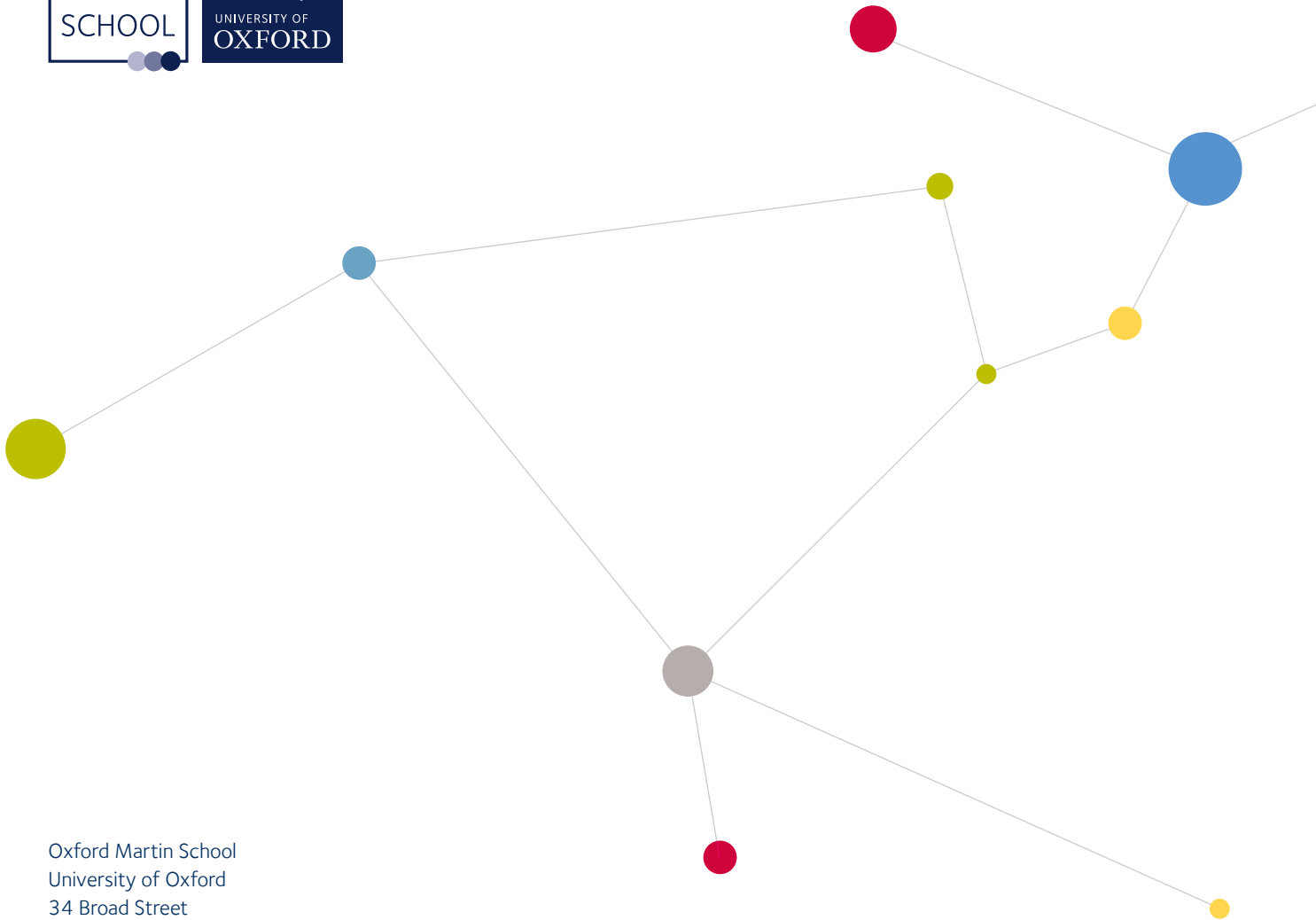
**Professor Alex Halliday**, Head, Mathematical, Physical and Life Sciences Division

**Professor Ian Walmsley**, Pro-Vice-Chancellor, Research

**Professor Shearer West**, Head, Humanities Division

**Professor Sarah Whatmore**, Head, School of Geography and the Environment





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