

Imperial College
London

**THE
FORUM**

**Where science
meets policy**

2018–2019

Contents

Foreword from the Vice-Provost (Research and Enterprise)	3
The Forum	4
Our workshops	5
AI and the future of work	6
AI and health	9
Air quality	10
Data privacy	13
Decarbonising industry	14
Food and nutrition	17
Personalised medicine	18
Vaccines	21
Our training for Imperial staff	22
Imperial's multidisciplinary networks, centres and institutes	23
Who has come to our workshops?	26

Foreword

It gives me great pleasure to introduce The Forum, our programme to connect Imperial researchers with policy makers to debate, discuss and discover new thinking on policy challenges.

Imperial is a research powerhouse. Our people share ideas, expertise and technology to find answers to the big scientific questions and global challenges of our time. We want our research to make a real difference by impacting policies that address the major issues of today.

The Forum provides an opportunity for Imperial researchers and policy makers to work together to examine

complex research and policy landscapes. Through workshops, seminars and clinics The Forum encourages the open exchange of expertise and knowledge between our staff and decision makers, enabling research to be informed by real global issues.

During my time as Chief Scientific Adviser for National Security I saw first-hand the vital role that science can play in policy development and in government more widely. It is now more important than ever that the world class research undertaken here at Imperial is made available to those making policy so that it can be used to help find solutions to global challenges. That is our mission.

Yours sincerely,

Professor Nick Jennings
Vice-Provost
(Research and Enterprise)



The Forum

The Forum is Imperial's policy engagement programme. It connects Imperial researchers with policy makers to discover new thinking on global challenges.

Through The Forum policy makers develop relationships with Imperial researchers working in subject areas relevant to their work. This allows the latest research to be shared in support of evidence-based policy development. The Forum builds on the strengths of Imperial's Networks and Centres of Excellence and our Global Challenge institutes.

This year we have focused our work directly on the Grand Challenges identified in the Government's Industrial Strategy:

- Artificial intelligence and data
- Clean growth
- Ageing society
- The future of mobility

We support our researchers through a variety of policy engagement seminars and clinics to help them better engage with public policy and to understand the research need of government.

The Forum in numbers



8 Subject-specific workshops for policy makers



13 Policy engagement seminars and policy clinics for Imperial researchers



26 Government departments, bodies and NGOs whose representatives attended our workshops



88 Imperial researchers have attended our training seminars and clinics

Our workshops

The Forum hosts regular workshops on areas where our research can help answer policy questions.

They allow Imperial researchers to discuss their latest findings with civil servants from across government, parliamentary staff and partners from industry and the third sector. This offers opportunities for confidential discussion and building long-lasting relationships between academics and government, and with the wider policy community.

Past workshops have included:

- Artificial intelligence and the future of work
- Artificial intelligence and health
- Air quality
- Data privacy
- Decarbonising industry
- Food and nutrition
- Personalised medicine
- Vaccines

A flavour of the discussions at these workshops are set out in the following sections; they include details of the Imperial researchers who presented their work. We are also grateful for the insightful contributions of the many policy makers who attended.

Our workshops have taken place in the fantastic facilities at Imperial's Data Science Institute (DSI). They have been aided by the invaluable support of the DSI staff. Our presenters have used the DSI's Data Observatory (DO), the largest of its kind in Europe. Opened in November 2015, the DO provides an opportunity for academics and industry to visualise data in a way that uncovers new insights, and promotes the communication of complex data sets and analysis in an immersive and multi-dimensional environment.

AI and the future of work

Artificial intelligence will bring significant changes to the world of work. While there will be activities which will be automated, it's perhaps more helpful to think of AI working in partnership with humans, which will bring great opportunities but also challenges.

Many of the most exciting developments in AI are happening at research-intensive universities like Imperial. We are world leading in artificial intelligence research, with over 600 people working in this area.

Our workshop focused on the impact AI will have on the future of work. Dr Mark Kennedy of Imperial College Business School led discussions. They focused on how AI will impact specific tasks rather than displacing whole jobs and how organisations can adapt to a data driven economy, including by training the next generation in data literacy.

As well as guests from government, we were joined by speakers from KPMG, focusing on digital transformation in the multinational corporation, and AVADO, an international learning business, focussing on training in digital and data. This made the workshop a truly cross sector discussion involving academia, government and industry.

Presenters:

- Dr Mark Kennedy, Imperial College Business School
- Donne Burrows, KPMG
- George Eiloart, AVADO
- Ben Rowland, AVADO

Dr Mark Kennedy presents on AI and the future of work.





Our workshops

AI and health

Healthcare is seeing the beginnings of a paradigm shift thanks to artificial intelligence and data, enabled by new approaches in collecting and analysing healthcare data. AI has the potential to bring huge benefits for both patients and the health service, including in diagnosis decision-making and modelling.

Our researchers benefit from collaborating across disciplines in an institution that is at the forefront of the AI and data revolution and has a leading medical school.

Imperial academics at our AI and health workshop discussed a number of key research projects cutting across both disciplines. Dr Kristijonas Čyras spoke about the potential for AI in Clinical Decision Support (such as IBM's Watson), while Dr Ben Glocker demonstrated how machine learning can be used to analyse medical scans effectively.

Led by Dr Aldo Faisal, who runs Imperial's AI Network, discussions focused on the potential of AI to enhance health care and how the right regulatory processes and environment can be put in place to make that a reality.

Presenters:

- Dr Kristijonas Čyras, Department of Computing
- Dr Ben Glocker, Department of Computing
- Dr Aldo Faisal, Departments of Bioengineering and Computing

Dr Kristijonas Čyras in discussion with government officials at the AI and health workshop.

Air quality

Air pollution is now the world's fourth biggest killer. High levels of pollutants including gases and particulate matter result in harm for both human health and the environment. Research is vital to ensure that air quality can be effectively monitored, its impacts quantified and solutions found.

New understanding on the negative health impacts of air pollution show why it is now more important than ever that world class research is available to government.

We held a workshop aimed at discussing and addressing poor air quality. Researchers from all four Imperial Faculties discussed with guests from government the wide ranging possibilities for health promoting policies relating to air quality.

Among others, Professor Terry Tetley explained the impact of air pollution on heart and lung health. Dr Audrey de Nazelle spoke about how we could rethink cities to improve air quality and promote exercise and Dr Laure Preux posed the question of whether there should be a 'price for pollution'.

Presenters have included:

- Dr Audrey de Nazelle, Centre for Environmental Policy
- Dr Laure de Preux, Imperial College Business School
- Dr Heather Graven, Department of Physics
- Dr Marc Stettler, Department of Civil and Environmental Engineering
- Professor Terry Tetley, National Heart and Lung Institute

Dr Marc Stettler, who presented at our air quality workshop, welcomed Michael Gove MP to Imperial College London to launch the Government's Clean Air Strategy in May 2018.





Our workshops

Data privacy

Over the past decade the world has seen major advances in technology and digitalisation, while our increasingly connected lives see us create data every day. These vast datasets offer huge potential benefits for society, but they also mean growing risks to individual privacy.

The challenge for researchers is to unleash the benefits of big data while mitigating the risks it can pose to our national security and individual privacy. Our workshop focussed on data privacy. Discussions ranged from the cyber security of critical infrastructure and healthcare records to wider individual data privacy.

Presenters included Dr Yves-Alexandre de Montjoye who leads the Computational Privacy Group at Imperial and is a Special Adviser to the European Commission. He discussed his work on how individuals can be identified through the use of metadata. Another speaker was Dr Jennifer Quint of the Faculty of Medicine.

She spoke about the use of NHS data, explaining how the anonymous use of securely processed information can be vital for finding links that can lead to future treatments and prevention of illness.

Presenters have included:

- Dr Yves-Alexandre de Montjoye, Department of Computing
- Dr Dalal Alrajeh, Department of Computing
- Professor Chris Hankin, Institute for Security Science and Technology
- Dr Jennifer Quint, National Heart and Lung Institute

Dr Dalal Alrajeh presents at The Forum workshop on data privacy.

Decarbonising industry

Climate change is one of the greatest challenges facing mankind. The actions required to address it will require business, governments and universities to work together.

In May 2019 Prime Minister Theresa May visited Imperial's Carbon Capture Pilot Plant to announce that the Government will aim to meet the Committee on Climate Change's target of net zero greenhouse gas emissions by 2050.

One of the keys to meeting this ambitious goal will be to ensure that industry is able to decarbonise. At present, around a fifth of global emissions come from industry.

Imperial is at the forefront of research in this area. So The Forum and Imperial's Grantham Institute, which covers climate change and the environment, jointly ran a workshop on decarbonising industry.

Professor Nilay Shah and Dr Niall Mac Dowell provided an overview and led discussions with policy makers. Others went into the specifics of how industry can decarbonise. Professor Paul Fennel set out his work designing new processes that integrate Carbon Capture and Storage in areas such as iron and steel

production and Dr Gbemi Oluleye spoke about accelerating the adoption of Low-Zero Carbon Technologies, looking at the impact of incentives, business models and market forces.

Presenters have included:

- Professor Nilay Shah, Department of Chemical Engineering
- Dr Niall Mac Dowell, Centre for Environmental Policy
- Professor Paul Fennel, Department of Chemical Engineering
- Dr Gbemi Oluleye, Department of Chemical Engineering
- Nixon Sunny, Department of Chemical Engineering

Theresa May visits Imperial's Carbon Capture Pilot Plant.





Our workshops

Food and nutrition

The continued global increase in non-communicable disease is driven through change in lifestyle, a major component of which is food. In many areas of the world, under-nutrition and food shortages remain a major problem, while expanding populations and rapid urbanisation are leading to challenges on resources, food, energy, and waste globally.

At Imperial researchers are exploring novel approaches to food design and functionality, as well as understanding how food interacts with the metabolism and the underlying effect of food and nutrition on public health.

We held a workshop focussing on key research on food and nutrition and exploring its policy implications. Presenters such as Dr Elisabetta Aurino and Dr Lesley Drake focused on nutrition and child development in low and middle income countries.

Professor Gary Frost, who presented at our food and nutrition workshop, launches Imperial's new Network of Excellence in Nutrition and Food (now Centre for Translational Nutrition and Food Research).

Others such as Dr Marisa Miraldo and Dr Edward Chambers focused on healthy eating choices to reduce obesity and other non-communicable diseases.

Presenters have included:

- Dr Lesley Drake, School of Public Health
- Dr Elisabetta Aurino, Imperial College Business School
- Dr Marisa Miraldo, Imperial College Business School
- Dr Edward Chambers, Department of Medicine
- Professor Maria Charalambides, Department of Mechanical Engineering
- Dr Dagfinn Aune, School of Public Health

Personalised medicine

Personalised medicine has the potential to revolutionise healthcare. It moves away from a 'one-size-fits-all' approach to treatment towards a personalised one. By using the latest scientific advances and new technologies, such as individual genetic profiling and the huge leaps in data availability and processing, it tailors decisions about the prevention, diagnosis and treatment of disease based on each individual patient.

Imperial researchers from across our faculties, Medicine, Engineering, Natural Sciences and the Business School, are working to create treatment strategies that are tailored to the individual profile of each patient.

We held a workshop on personalised medicine, helping health policy makers to scan the horizon for advances in this area. Researchers presented a wide variety of developments in personalised medicine. From Professor Anthony Gordon, who described how an AI Clinician can learn optimal treatment strategies for sepsis in intensive care, to Dr Jia Li, who set out

research on gene-environment interactions and how they can contribute to predicting and treating disease.

Presenters have included:

- Professor Philippe Froguel, Department of Medicine
- Dr Jia Li, Department of Surgery and Cancer
- Professor Anthony Gordon, Department of Surgery and Cancer
- Dr Kirill Veselkov, Department of Surgery and Cancer

Dr Jia Li from the Department of Surgery and Cancer spoke at the personalised medicine workshop.





Our workshops

Vaccines

Vaccines are one of the great success stories of modern healthcare; they have eradicated or controlled diseases that previously affected huge parts of the population and continue to improve the lives of millions.

Infectious diseases still cause around 7% of all deaths in the UK. Vaccines are a vital mechanism for controlling infectious disease outbreaks. However many infections still cannot be prevented and major hurdles to developing effective vaccines exist.

Vaccines were the topic of a workshop, with Imperial researchers and guests from government and the third sector discussing the policy implications of the latest research for both health in the UK and in low and middle income countries.

Dr Chris Chiu, who leads Imperial's Network for Vaccine Research (INVaR) gave an overview of major vaccines initiatives around the world, and set out the need to accelerate the path to widespread availability.

Professor Robin Shattock described new techniques that could revolutionise both the manufacture and storage of vaccines. Professor Jill Gilmore spoke about her work towards a vaccine for HIV as part of the International AIDS Vaccine Initiative.

Presenters have included:

- Dr Chris Chiu, Department of Medicine
- Professor Jill Gilmore, Department of Medicine
- Professor Robin Shattock, Department of Medicine
- Krystal Lau, Imperial College Business School

Krystal Lau presents at the vaccines workshop.

Our training



Our policy engagement seminars

The Forum organises monthly seminars for Imperial researchers which focus on building political engagement expertise. Topics include the policy making process, mapping key decision-makers and how to influence policy.

Our writing clinics

Our lunchtime policy clinics for Imperial researchers consist of 1-1 or small group discussions about how to communicate to and summarise research for policy makers. Participants are walked through the processes of building a policy briefing and get the chance to discuss examples. They then get feedback as part of an interactive discussion with a member of The Forum Team.

Imperial's research

As well as our Faculties – **Engineering, Medicine, Natural Sciences** and the **Business School** Imperial also has multidisciplinary research structures.

The Imperial **Centres of Excellence** aim to galvanise a critical mass of researchers, transcending Faculty boundaries to support a multidisciplinary theme.

The Imperial **Networks of Excellence** aim to establish and grow connections around an important multidisciplinary area that is being explored at an earlier stage than the centres. Our **Global Challenge Institutes** harness the talents of a wide variety of researchers to address some of the world's most important issues.



Networks, Centres and Institutes

Networks of Excellence

Agri Futures Lab
Air Quality
Antimicrobial Resistance
Artificial Intelligence
Cancer Technology
Diabetes
Financial Technology 'FinTech'
Frontiers of Ultrafast Measurement
Glycobiology
Human Behaviour and Experience in STEM
Industrial Biotechnology
Innovative Imaging Across Scales
Malaria
Marine and Coastal Environments
Microbiome @ Imperial
Neuromuscular Rehabilitation Technology
Ocean Plastic Solutions
Physics of Life
Probabilistic methods and modelling
Robotics Forum
Space Lab

Stem Cell and Regenerative Medicine
Sustainability through Life Cycle Approaches
Trauma Bioengineering
Vaccine Research
Vascular Science
Wound Healing and Regeneration

Centres of Excellence

Blast Injury Studies
Cardiac Engineering
Chemical Biology
Clinical Application of Particles
Complexity Science
Drug Discovery Science
Infrastructure Robotics Ecosystems
Integrative Systems Biology and Bioinformatics
Mathematics of Precision Healthcare
Musculoskeletal Medical Engineering
Neurotechnology
Performance Science
Plastic Electronics
Quantum Engineering, Science and Technology
Rapid Online Analysis of Reactions
Structural Biology
Synthetic Biology
The Thomas Young Centre (the London Centre for Theory and Simulation of Materials)
Translational Nutrition and Food Research Institute

Global Challenge institutes

Data Science Institute
Grantham Institute – Climate Change and the Environment
Institute of Global Health Innovation
Energy Futures Lab
Institute for Security Science and Technology
Institute for Molecular Science and Engineering

Who has come to our workshops?

Government departments and bodies

Cabinet Office
Department for Business, Energy and the Industrial Strategy
Department for Education
Department for Health and Social Care
Department for International Development
Department for the Environment, Food and Rural Affairs
Department for Transport
Government Office for Science
HM Treasury
Innovate UK
NHS Digital
Office for Artificial Intelligence
Office for Life Sciences
Public Health England

Parliament

Digital, Culture, Media and Sport Committee
Health and Social Care Committee
International Development Committee
Parliamentary Office of Science and Technology
Science and Technology Committee

Other organisations

Academy of Medical Sciences
Centre For London
Committee on Climate Change
Energy UK
Future Advocacy
General Medical Council
Medicines Discovery Catapult
PHG Foundation
Policy Connect
Policy Exchange
Reform
Results UK
Save the Children
WWF



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the.forum@imperial.ac.uk

imperial.ac.uk/the-forum

[@imperial_forum](https://twitter.com/imperial_forum)