



The Journal of the
Parliamentary and
Scientific Committee

SCIENCE IN PARLIAMENT

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SPRING 2015



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Andrew Miller MP
Chairman, Parliamentary and
Scientific Committee

I am writing this in November because it has been a momentous week

Very few scientific experiments take ten years. But today we learned that a 300 million mile journey of an object the size of my fridge had successfully landed on a meteor travelling at more than 30,000 mph, ten years after it left Earth.

I have always had a sneaking admiration for darts players who can hit the target, or

snooker players who can skim the black into the pocket, but this is something else. Somebody likened it to throwing a hammer in the air in London and hitting a nail in Beijing!

By the time you are reading this we may have started to understand what has been uncovered about the history of the solar system, but what a story it will be.

At the same time, we discovered that the EU is dispensing with scientific advice as a basis for decision making. Anne Glover will be returning to the UK (since Scotland remains part of it!).

Anne, like all balanced scientists, has taken a positive approach to GM crops, and the Select Committee, which I chair, will be producing a report on this topic. It is little short of disgraceful that the EU

is giving in to lobbying by vested interests and I hope the science community protests loudly. Sadly, it remains the case that some politicians (including in the UK) put personal prejudice ahead of evidence based policy.

I will finish on a positive note. In 2014 we celebrated our 75th anniversary. HRH The Duke of Edinburgh has been an Honorary Member for more than 50 years, and served as our President in 1989. We were delighted that he agreed to host a reception at Buckingham Palace on 11th November to mark this. 150 representatives of our members were able to marvel at the works of art in the Picture Gallery, and to enjoy wine, canapés, music and company.

The P&SC is in good shape for its next quarter century.



The Journal of the Parliamentary and Scientific Committee.

The Committee is an Associate Parliamentary Group of members of both Houses of Parliament and British members of the European Parliament, representatives of scientific and technical institutions, industrial organisations and universities.



Science in Parliament has two main objectives:

1. to inform the scientific and industrial communities of activities within Parliament of a scientific nature and of the progress of relevant legislation;
2. to keep Members of Parliament abreast of scientific affairs.

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The covers of this issue are sponsored by the British Society of Soil Science, the Energy Institute, the New Engineering Foundation and the British Pharmacological Society.

HOOKING UP HULL: THE HULL ELECTRIFICATION PROJECT



Mac Andrade
Director of Infrastructure at
FirstGroup

Last March the Secretary of State for Transport, Patrick McLoughlin, announced Government support – by way of a £2.4m grant – for the electrification of 33 miles of railway between Hull and Selby. Welcomed by all, this was testament to the Department for Transport’s prioritisation of railway electrification for 2014 to 2019.

What makes the Hull Electrification Project (HEP) stand out from almost all other electrification schemes is that it is intended that the initial development and construction costs will be almost entirely privately funded, with FirstGroup securing major funding from infrastructure group Amey.

As well as delivering a better service to users of the railway – and the wider economic benefits that it will bring to Hull – the HEP is therefore good for the UK taxpayer, protected from the up-front capital expense and financial risk involved with such a project.

WHY HULL?

Until the conception of the Hull Electrification Project, Hull was the only major city in the north of England for which there was no plan to electrify its main railway line. What made this more significant was that the diesel services running to and from Hull would be incompatible with the lines being electrified across the wider north, between Selby and Liverpool and York, via Manchester and Leeds. Far from benefiting Hull, this inequality of infrastructure would have had a negative impact on the city’s economy.

First Hull Trains, which currently operates on the line between Hull and London King’s Cross, is already one of the highest-ranked operators in terms of customer satisfaction. The addition of electrification will enable First Hull Trains to make major improvements on its excellent service.

WHAT ELECTRIFICATION WILL BRING

Electrification will bring the opportunity to run more efficient electric rolling stock with higher passenger capacity. It will link up the new line to other parts of the ‘electric spine’, improving journeys between Hull and the capital, as well as to Leeds, Manchester and Liverpool – and even more so once HS2 and TransPennine electrification come into force.

As well as the long term benefits of both temporary (construction) workers and permanent job creation that would come with an expanded Hull to London service, electrification will also help attract investment, and can be an important driver of growth to the Hull and Humber Region. Already enjoying a greater profile as the host of the 2017 City of Culture, Hull is undergoing an economic and cultural renaissance, something that FirstGroup – through First Hull Trains and the HEP – is proud to be a part of.

In order for the city to realise its potential, modern railway infrastructure is needed. The speedy delivery of the HEP can only further the ambitions of the city and its businesses.

URGENCY: MAKING ELECTRIFICATION HAPPEN

Patrick McLoughlin’s announcement last March represented a milestone for the HEP.

With Government support, it meant FirstGroup’s work to secure nearly £100m of private funding can be released to progress the Project through the feasibility phases, construction

and, ultimately, the delivery of services.

It is essential that the momentum of the Hull Electrification Project is maintained so that it can be delivered as soon as possible.

The HEP team is committed to an ambitious timetable and is working with its stakeholders, including MPs along the route, and partners in Network Rail, to meet this. But it is also incumbent upon the Government to agree a guaranteed price with the HEP before the end of this Parliament.

A commitment from the Chancellor of the Exchequer to electrify the Hull to Selby line in the Budget on 18 March would ensure the Project’s long-term progress and help mitigate against political risks involved with any major infrastructure scheme that coincides with a general election and a change in government.

WIN-WIN

The electrification of the Hull to Selby railway line is a win-win for the tax-payer, the Government, the rail passenger, and the city of Hull; its residents and businesses, as well as those who live and work throughout the Humber region.

It is essential that the Project progresses as swiftly as possible to ensure benefits are delivered without any unnecessary delay.

FirstGroup prides itself on the way it works with its partners and stakeholders. Our Hull Electrification Project team will continue to work in partnership in order to make Hull electrification a reality.

75TH ANNIVERSARY CELEBRATION

The Parliamentary and Scientific Committee has often been described as the “doyen” of APPGs. It is certainly the oldest – having celebrated its 75th anniversary last year.



HRH The Duke of Edinburgh

It is best known for its monthly discussion meetings on scientific topics where leading exponents engage with Parliamentarians.

It is proud that its first report addressed “the Nutritive Value of Bread” – a vital topic throughout WWII. One of the members was Sir Jack Drummond, the man responsible for the absence of bananas during the war. Their nutritional value was not great enough to justify the hazard to the merchant navy of shipping them to Britain.

It is probably the only APPG to have had a Nobel Laureate as a President. (Sandy) Lord Todd was probably also the tallest President!

Imitation being the sincerest form of flattery, it is gratifying that it has spawned more than 600 APPGs at the latest count.

HRH The Duke of Edinburgh has been an Honorary Member for more than 50 years, and has been Guest of Honour at the Annual Lunch on no less than three occasions. He has also served as our President.

The Committee was therefore delighted that he agreed to host a reception in the glorious surroundings of the Picture Gallery in



Dr Stephen Benn, HRH The Duke of Edinburgh, Emily Benn and Daniel Benn



Dr Stephen McGinness, Dr Stephen Benn, Stephen Metcalfe MP, Andrew Miller MP, Stephen Mosley MP

Buckingham Palace. He personally greeted Chairman Andrew Miller, President Lord Oxburgh, Deputy Chairman Stephen Metcalfe, Hon Secretary Stephen Mosley as well as one of our senior members, Dr Peter Jost CBE.

Looked upon by the Gallery's Rembrandt, van Dyke, Titian and other greats, HRH mingled and talked with members. More than 150 guests representing many of the member bodies, enjoyed canapés and wine. Music being the food of everything, it was accompanied by Mozart, Haydn and Elgar played by a delightful string quartet.

For more than an hour His Royal Highness conversed with a wide range of scientists in a relaxed atmosphere. This was enjoyed by all present, including Prince Philip, we were told.

In his words of gratitude to His Royal Highness, the President Lord Oxburgh emphasised how appreciative the Committee was for his support, and reminded him that in addition to his own three visits, we had also received the Prince of Wales and the Princess Royal.



David Youdan, Paul Jackson and Sir Peter Williams



Lord Oxburgh, HRH The Duke of Edinburgh, Andrew Miller MP, Dr Peter Jost, Stephen Metcalfe MP and Stephen Mosley MP



Mrs Louise Kingham, Professor John Loughhead, Nigel Fine and Professor John Perkins

Chairman, Andrew Miller, MP for Ellesmere Port said:

"A glance at the guest list at this celebration shows the high esteem in which the P&SC is held amongst leading scientists, learned societies and industrialists." He concluded that the Committee was in fine fettle and looking forward to the next quarter century.

Since the foundation of the P&SC much has changed, especially the effects of ever rapidly changing Science and Technology. This anniversary has therefore provided an opportune starting point for the P&SC to review its activities. Its aim is to be of use to the next Parliamentarians. In areas of non party, non political and non commercial activities, the P&SC will continue to excel.

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Lord Waldegrave of North Hill and Sir Peter Bottomley



Clare Campbell and Professor Lesley Yellowlees



The Earl of Cranbrook and Ms Katy Schneider



Stephen Grinham, Alex Connor and HRH The Duke of Edinburgh



Dr Sue O'Hare, Dr Kirsten Pullen, Dr Linda Thomas



Dr Tony Whitehead, Lord Oxburgh and Kirsten Bodley



Dr Guy Hembury, John Slater and Dr Graham Clayton



Dr Matthew Frost, Dr Bev Mackenzie and Dr Ben North

FRANCE BANS USAGE OF PESTICIDES IN TAXPAYERS AND LOCAL AUTHORITIES GARDENS



Dr Claire Mouchot
Science and Technology
Department
French Embassy, London

A new Bill aiming at “creating a better framework for the use of plant protection products within the National borders”

A bill (known as No 2014-110¹) passed in Parliament in January 2014 states that as of 2020, plant protection products will be banned for use in French local authority public gardens and in private gardens two years later.

The draft bill which was proposed by the environmentalist Senator Joël Labbé was designed to establish a better framework regarding the use of plant protection products within national borders. In essence, the Act bans plant protection products, commonly called pesticides (insecticides, fungicides, herbicides, parasiticides, etc):

- from 1st January 2020 for their use in maintenance of green spaces, forests and footpaths open to the public, with the exception of specific areas such as airports, rail tracks, etc. (Article 1);
- from 1st January 2022 for their sale, use and storage for non professional usage with

the exception of fighting against propagation of harmful species. Non-compliance with the law will incur penalties (Article 2).

This second article targets specifically the 45% of French citizens who own a garden or an allotment, which represent approximately 5-10% of pesticides usage in the country – the remaining 90-95% being used in the agricultural sector.

Many environmentalists believe this is a small victory in the fight against the blanket use of pesticides with the new law becoming the cornerstone that will change people's attitude and behaviour towards these products.

Having said that, approximately 40% of French towns and cities haven't waited for this new law to start the “green revolution” toward more environmentally friendly maintenance of public green spaces. In Versailles, for instance, pesticides have been entirely replaced by thermal,

mechanic and hand held cutters, saving 130,000 litres of pesticides and £25,500 annually. In Nantes and Rennes (Brittany) usage of pesticides has decreased in the last 10 years by 95% and 90%, respectively.

The French Government pushes on several fronts to accelerate the demise of pesticides usage

The Secretary of State for Agriculture, Mr Stéphane Le Foll, has proposed amendments on a draft bill on the future of agriculture, food and forestry which have been well received by MPs in July 2014 and the Senate in the Autumn. In its current wording, the bill proposes that spreading plant protection products will only be permitted in areas close to schools, nurseries, nursing homes, hospitals or health centres when specific safety measures have been put in place to reduce drastically exposure of vulnerable people.

PESTICIDES, A HETEROGENEOUS “CLASS” OF PLANT PROTECTION PRODUCTS

Of approximately 1,000 products that have accessed the market, 309 are authorised for use in France. These vary according to their mode of action, target, chemistry and half-life period in the environment. They are to be found everywhere in the environment: in the air inside and outside as dust; in underground, surface or littoral waters; in the ground and even in some food, including drinking waters. Professional exposure generally occurs via cutaneous way but can also take place via the respiratory system in fumigation or usage in close environment. In the general population however the most common route is oral exposure via food intake.

Among these measures were existence (or new planting) of hedges or spreading at specific times and days. Failing this, spreading will not be permitted in a specific area surrounding the location, the size of which will be determined locally on a case by case basis.

If the co-chair of the Environment party, Barbara Pompili, indicates that Mr Le Foll's amendments wording is a "compromise" that represent "a good start" she insists that the use of pesticides is "a challenge for public health issues that affects all parties – farmers, their families and the general public that lives nearby". Given that arable land represents approximately half of the French territory, this accounts for a lot of people.

In parallel three items of another draft Bill, this one on Biodiversity proposed by Mrs Ségolène Royal, Secretary of State for Ecology, were passed in the Assemblée Nationale. These concerned:

- the outright ban of aerial application of pesticides from the end of July 2014 for crops such as sweet corn, popping corn and banana



Jardin des plantes in Nantes

Credits: cc-BY-SA 3.0, Stefi123

- and at the end of 2015 for rice and some vineyards;
- the promotion of natural products for plant treatment and maintenance via their acceleration of regulatory approval for marketing authorisation;
- extending the action «Terre saine, communes sans pesticide» (Healthy ground/earth, pesticide-free towns) and bringing forward by 4 years the expected starting date at which the law should enter into force from 1st January 2020.

These new laws are supported not only by the French public but also by new scientific evidence

All these measures come at a time of growing discontent among the French population regarding the use of pesticides: a petition asking for restriction of their use in areas close to schools and habitations has registered nearly 100,000 signatures in less than a week and an increasing number of GPs voice their anxiety. In addition, two meta-analysis of scientific publications were

... environmentalists believe this is a small victory ...



Family garden in Versailles

Credits: cc-BY-SA 3.0, Patrick.charpiat

published within a year.

In the first, the French Government (Directorate General for Health) commissioned the French National Institute for Health and Medical Research (Inserm) for a meta-analysis of scientific publications of the last 30 years in order to obtain more evidence-based information regarding the health hazard posed by pesticides, in particular on their suggested links with

several pathologies including cancers, neurological diseases, reproductive effects. Experts from different backgrounds (epidemiologists in health-environment or occupational health, cellular and molecular toxicologists) worked in collaboration to produce a thorough report which was published in June 2013². The results (in French), confirm the possibility of a positive association between professional exposure to pesticides and various adult diseases such as Parkinson disease, prostate and several hematopoietic cancers. Similarly, exposure to pesticides during prenatal and perinatal periods seems to show increased risks for the infant's development.

The second meta-analysis, titled "systemic pesticides pose global threat to biodiversity and ecosystem services" was published by The Task Force on Systemic Pesticides³ on 24th June 2014. The conclusions confirmed that pesticides neonicotinoids and fipronil cause significant damage to a wide range of invertebrate species (including earthworms, insect pollinators such as bees and butterflies and fresh water snails and water fleas) and are measured in significant concentrations in wider areas due to spreading via natural water systems.

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WHAT IS THE PURPOSE OF THE INTERNATIONAL YEAR OF SOIL 2015?

Matt Aitkenhead

Willie Towers

Helaina Black

Liz Baggs

Representatives of the
British Society of Soil
Science

Soil is fundamental to life on Earth but human pressures on soil resources are reaching critical limits. Soil is as essential as air and water but rarely receives the same attention.

WHY DOES SOIL MATTER?

The importance of soil to people around the world should ideally be obvious to the casual observer, but is often ignored in political and economic debates. We often take for granted that soil will be able to maintain food production into the future but this narrow perception is being challenged as we strive for food security alongside pressing issues of water, energy, climate change and biodiversity conservation. We now recognise that soil has a central role in delivering water quality, flood regulation, climate regulation and habitats of high

conservation value. There are major management and restoration challenges to be tackled to ensure that we maintain a soil capital that is adequate, both in terms of stocks and in terms of quality, to meet these multiple and contrasting needs of people into the future. At present the global soil capital is being eroded and lost rather than preserved and restored. Over one-third of the world's agricultural soils are degraded and require rehabilitation or restoration while expanding urban and industrial development is reducing the stock of soil capital at an alarming rate¹. Assuming a continuing trend, in the next 100 years, we would lose soil over an area comparable to the surface of Hungary.



Not all soils are the same. Only a relatively small proportion (ca 14%) of the world's soils can grow food without major intervention. There are approximately 32 groups of soil around the world², and many thousands of subtle variations within these. Each of these has

its own characteristics with a capacity to support a range of ecosystem goods and services. Our highest value agricultural soil is typified by a balance of mineral materials, organic matter and nutrients. Our best carbon storing soil is peat which is predominately made up of decomposing soil organic matter, accumulated over many 1000s of years and can be many metres deep. All soils retain carbon to some degree and soil is the largest terrestrial store of carbon. Soil has a pivotal role in climate change mitigation as well as future adaptation. How soils around the world respond to a changing global climate will dictate the availability of food and water in the future.

importance of soils to life on Earth, and to raise awareness of the numerous ways in which soil impacts on our daily lives. Around the world, organisations involved with soil education, soil research or soil use and management will be showcasing their work to a variety of interest groups. These events around the world can be found at the Global Soil Partnership (GSP) website: <http://www.fao.org/globalsoilpartnership/iys-2015/en/>. The Global Soil Partnership was founded in 2012 with the support of the FAO (Food and Agriculture Organisation of the United Nations) as an interactive, responsive and voluntary partnership, open to governments, regional organizations, institutions and other stakeholders. The first GSP Plenary Assembly in 2013 endorsed the formation of the Intergovernmental Technical Panel on Soil which is now working to produce the first World Soil Resources Report for publication in 2015. The second GSP Plenary in 2014, involving the FAO Member Countries as well as non Governmental organisations and institutions, endorsed an updated World Soil Charter and Plans of Action to:

- Promote sustainable management of soil resources.
- Encourage investment, technical cooperation, policy, education awareness and extension in soils.
- Enhance the quantity and quality of soil data and information.

THE INTERNATIONAL YEAR OF SOIL 2015

It is for these reasons that the United Nations Assembly declared³ 2015 as the International Year of Soil and the 5th December every year as World Soils Day. 2015 is an opportunity to celebrate the

- Support harmonization of methods, measurements and indicators for sustainable soil management across all terrestrial ecosystems.

WHAT DO WE NEED FROM SOIL SCIENCE?

Soil is one of the most complex natural systems known. This complexity is one of the greatest assets of soil since it confers the ability to deliver multiple benefits and a degree of resilience to disturbance. Many soils can continue to maintain food production while in a highly altered or even degraded state. However the social, economic and environmental consequences for other ecosystem goods and services are now becoming equally recognised as we strive to achieve water, energy, climate and conservation needs alongside food production. Soil is unique in being the interconnection between these demands. Without successful soil use and management for multiple benefits we will not meet the needs for future generations.

Scientists have been studying soil for over a hundred years. Even Charles Darwin was fascinated by the formation of soils⁴. Today, soil scientists come in many different guises as soil science is truly a multi-disciplinary science. Researchers from natural sciences, social science and economics are working to tackle soil challenges. Advances in molecular biology and mathematical modelling are being applied to soils to uncover and simulate how complex biological, chemical and physical interactions enable soil to support diverse ecosystem goods and services. A few of these soil challenges have been taken up in the recent UK Research Council funded programmes and studentships^{5,6}.

The UK has a thriving soils research community with a strong international reputation exemplified by the British Society of Soil Science winning the bid to host the World Congress of Soil Science in 2022. The UK science community needs the right funding opportunities to foster collaborative transdisciplinary research to match the advances made elsewhere such as the Human Genome Project or Climate Modelling.

REPRESENTING SOIL SCIENTISTS AND PROMOTING SOIL SCIENCE

The British Society of Soil Science (BSSS⁷), a learned society, was formed in 1947 and is now an established international membership organisation and charity committed to the study of soil in its widest aspects. Our broad membership enables the BSSS not only to represent the skills and expertise of soil scientists within the UK, but also to deliver training. In 2011, the BSSS launched "Working with Soil"⁸ as

a competency scheme to establish professional standards for people in the UK and Europe. Working with Soil is now endorsed by over 50 organisations including Government bodies, agribusiness, research, consultancies and NGOs. As part of its goals, the BSSS is committed to increasing the awareness of soils and in promoting education across all sectors of society. As part of this, the BSSS supports two international journals. The International Year of Soils is an ideal platform for the BSSS to demonstrate the breadth and depth of UK soils research which is applied in UK and



around the world, and to raise awareness of the importance of soils to the UK economy and Society at large.

HOW CAN YOU CONTRIBUTE TO THE INTERNATIONAL YEAR OF SOIL?

There are several high-level conferences and meetings in 2015. These include the 3rd Global Soil Week⁹ in Berlin, which is a multi-stakeholder platform for dialogue between policy-makers, scientists, NGOs and other stakeholders on soil matters in relation to food security, rural development,

the UK, and plan more of this throughout the year. We will be strengthening our relationships and coordinating activities with other societies, both national and international, such as the Nigerian Soil Science Society, and organising a series of school, public engagement and policy events. You can find out more about these activities on the BSSS website (<http://www.soils.org.uk/>), or follow us on twitter (https://twitter.com/Soil_Science), and we look forward to hearing from you in what promises to be a groundbreaking year for soil.

... soil has a central role ...

growth, energy production, and the competition for soil resources. Soil science will be well represented in Austria at the European Geosciences Union General Assembly (April 12-17, 2015). The EGU is attended by over 12,000 scientists from all over the world to one meeting covering all disciplines of the Earth, planetary and space sciences.

Within the UK, BSSS has a broad programme of events through the year in partnership with other learned Societies, organisations, Government and schools. We launched the year with a soil digging-tree planting event held at 30 schools across

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PUTTING UK PHARMACOLOGY ON THE MAP – FROM BENCH TO BEDSIDE



Katharine Richardson
Head of Communications and
Membership,
British Pharmacological Society

Pharmacologists have improved the lives of millions of people in the UK and worldwide. Thanks to their knowledge and expertise, the over 3,500 members of the British Pharmacological Society have a track record of tackling the most pressing problems facing society.

The British Pharmacological Society has, at its heart, the development and promotion of pharmacology and of its members who are training and working in academia, government, industry and the health service. The Society takes great pleasure in celebrating these achievements and campaigns for pharmacologists to continue to benefit the health and wealth of the UK.

THE ACHIEVEMENTS OF UK PHARMACOLOGY

The British Pharmacological Society recognised the achievements of UK Pharmacology with the announcement of its annual 'Putting UK Pharmacology on the Map' vote in Parliament on 15 December 2014.

The vote selected sites of special scientific interest linked to achievements in pharmacology based on a ballot of MPs, peers and senior members of the scientific community. For the second year Andrew Miller MP kindly took on the role of Returning Officer and revealed the names of the winning sites, judged to have made outstanding contributions to the discovery and development of medicines:

• Marischal College, The University of Aberdeen

Heather Wallace, Professor of Biochemical Pharmacology and Toxicology at the University of Aberdeen, said: "The University of Aberdeen has been at the forefront of research and innovation throughout its 500 year history. Pharmacology has been part of that history for over 50 years and the University can claim the rare distinction of two British Pharmacological Society Wellcome Gold Medal winners. This research on opioids and cannabinoids was carried out at Marischal College by Professors Kosterlitz and Pertwee and their teams. We are delighted the

pharmacology has been recognised with this award. It could be argued that, through his pioneering studies on the chemistry of drug action, Alfred J Clark was both Chair of Pharmacology at Edinburgh and the father of the modern subject. That aside the ground breaking work of Edinburgh researchers has been of high impact across the decades. This is highlighted by the outstanding contributions of Sir John Gaddum and Marthe Vogt on neurotransmitters that continues to aid our understanding and treatment of mental illness. Work by Eric Horton on prostaglandins opened the door

... benefit the health and wealth of the UK ...

importance of that early, and indeed continuing, work has been recognised in this way. Our research continues with vigour at the Institute of Medical Sciences on our Foresterhill health campus."

• The Department of Pharmacology, the University of Edinburgh:

Mark Evans, Professor of Cellular Pharmacology at the University of Edinburgh, explained: "The University of Edinburgh has a long tradition of discovery and innovation in the field pharmacology. I am delighted that its contribution to

to advances in the treatment of pain and inflammation that continues to this day."

• The Department of Molecular & Clinical Pharmacology, the University of Liverpool

Professor Munir Pirmohamed, from the University of Liverpool's Institute of Translational Medicine, commented: "We are delighted to have been chosen as one of the winning sites for Putting UK Pharmacology on the Map. The Department of Molecular and Clinical Pharmacology in Liverpool has maintained its identity, and

continues to promote leading edge research with seamless working between basic and clinical scientists. Its multi-disciplinary approach with collaborative working with academia, healthcare and industry is key to its success."

• **Sir William Dunn School of Pathology, the University of Oxford**

Professor Christoph Tang of the Sir William Dunn School of Pathology at Oxford University said: *"In the 1940s, treatment with penicillin seemed nothing short of miraculous. The discovery banished the threat posed by many infectious diseases that were leading killers of the time. The dedicated work at the Dunn School by the team*

... research on opioids and cannabinoids ...

of Florey, Chain and Heatley ushered in the age of modern medicine, and paved the way for drug discovery since then. I am delighted that this remarkable achievement has been recognised with this prestigious award, and I am proud to accept it on behalf of the scientists and staff at the Dunn School."

These winning sites joined four sites previously elected to the initiative in 2013:

- AstraZeneca, Alderley Park
- The James Black Foundation, King's College London
- The University of Strathclyde
- Wadham College, The University of Oxford

The back page of this issue includes the Society's members and parliamentarians who were able to join the celebrations: Stephen Metcalfe MP and Andrew Miller MP on behalf of the House of Commons Science and Technology Committee; Deputy Speaker Eleanor Laing MP; Dame Anne Begg MP and

Frank Doran MP congratulating the team from Aberdeen; and Louise Ellman MP congratulating the winners from Liverpool.

RECENT CAMPAIGNS

1. Advancing pharmacology in the UK

To coincide with the 'Putting UK Pharmacology on the Map' result, the Society identified what it believes are the secrets of success for sites where cutting edge research is nurtured in the UK.

"These sites of special pharmacological interest have made outstanding contributions to the discovery and development of medicines, and also to the health and economy of the UK. By learning from our

rich history, we can ensure that the UK remains at the cutting edge of research," explained Professor Humphrey Rang, President of the British Pharmacological Society. *"The UK has been a world-leader in medicines research and development, but recent changes have put this position under threat. Where are the next breakthroughs going to come from? There are obvious similarities in the sites that have been successful in the Putting UK Pharmacology on the Map*

... treatment of pain and inflammation ...

vote for the last two years. I hope these will be encouraged by team leaders, employers, funders and policy-makers in order to nurture future breakthroughs."

The secrets of success identified by the Society were:

- **Team identity:** successful sites have benefited from distinct identities, whether as standalone organisations or

working within much larger universities or companies.

- **Leadership:** the achievements of these sites can often be traced to the effectiveness of their charismatic, imaginative and determined leaders.

... help the NHS surmount the biggest financial challenge ...

- **Adequate resources:** while scientists have been able to work creatively within limitations, confidence in the longer-term availability of resources, including funding, is important.
- **Championing talent:** successful sites have attracted and developed skilled scientists.

The Society is a committed member of the Drug Discovery Pathways Group, which works to develop solutions to the needs of the wider medicines research community in three main areas: industry-academia partnerships, knowledge and skills.

2. Advancing clinical pharmacology in the NHS

The British Pharmacological Society launched a new report in November calling for an increase in the number of clinical pharmacologists across the four UK nations (available from:

bit.ly/NHSandCPT). The medical specialty of clinical pharmacology and therapeutics (CPT) is the only one focusing on the safe, effective and economic use of medicines, and is well placed to help the NHS surmount the biggest financial challenge since its creation.

Lord Robert Winston kindly hosted a reception to launch the report and noted, *"The NHS*

faces increasing demand for services and a decreasing budget. Evidence shows that clinical pharmacology is going to be vital if we are to meet this challenge, but the speciality has perhaps been a little too shy in coming forward. I am therefore pleased to help draw attention

to this under-recognised group of doctors and the steps needed to increase their number."

Clinical pharmacologists make a particularly valuable contribution to the NHS in areas including:

- Providing specialist and generalist **patient care**
- Leading clinical **toxicology** services
- Advising on **medicines policy** and **management**
- Providing **education** and **training** for undergraduates and postgraduates
- **Working with industry** to enhance the development of innovative new medicines
- Bringing innovation to the NHS through **experimental medicine**

In 2012, there were only 77 CPT consultants in the UK, with startling inequalities in provision across different regions, and significantly fewer than the 440 recommended by the Royal College of Physicians.

The Society is calling for a substantial increase in the number of registrar training posts and believes an increase in the number of consultants to 150 over the next decade is achievable – and necessary if the NHS workforce is to meet current and future demands.

MEDICAL PHYSICISTS AND BIOMEDICAL ENGINEERS: Unsung Innovators of the NHS



Dr Anna Barnes
Vice-President External
Institute of Physics &
Engineering in Medicine



Dr Elspeth Bartlett
Formerly External Relations
Manager
Institute of Physics &
Engineering in Medicine

The NHS has always been a world leader in healthcare innovation: constantly developing or improving technologies, treatments and ways of working. Doctors are usually perceived to be the prime source of this innovation. Indeed, the Medical Innovation Bill put before Parliament in 2014 focuses solely on the role of the doctor. Meanwhile, the contribution of NHS physicists and engineers continues to be substantial. With this article, we celebrate the vital role they play in keeping the NHS creative, productive and forward-looking.

The NHS depends on innovation to improve productivity, keep down costs and deliver better outcomes for patients. Knowledge and technology developed within the

NHS is exported, helping the UK's economic growth. It is important to understand how this innovation comes about, in order to nurture and promote it.

The Institute of Physics and Engineering in Medicine (IPEM) represents about 4,000 people working in medical physics and biomedical engineering. Most of our members work in the NHS although we also have members in academia and industry.

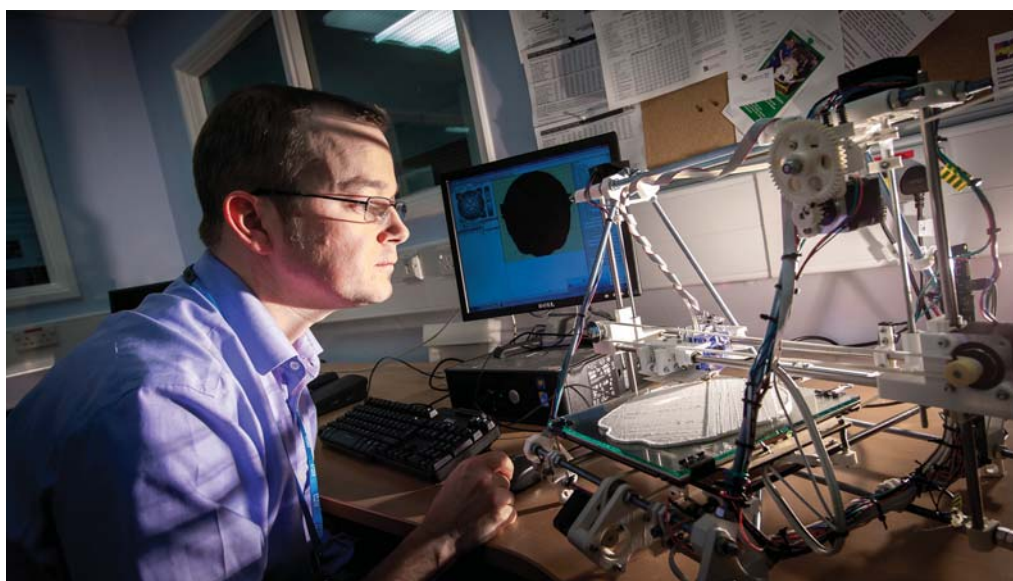
... world's first fully articulated bionic hand ...

Physicists and engineers have important roles within the NHS. Our members help to ensure that patients are correctly diagnosed and safely treated for illnesses such as cancer and stroke. They maintain and manage medical equipment and help ensure the safety of both patients and staff. However, they are also trained scientists,

creative thinkers and a driving force behind NHS innovation. Medical physics and biomedical engineering have long been major research strengths for the UK and many of the healthcare technologies now being used in the NHS and worldwide have their origin in discoveries by IPEM members.

Clinical imaging has changed the face of medicine and revolutionised diagnosis and

treatment. British physicists and engineers have been responsible for, or made major contributions to, the most widely used medical imaging techniques: Computerised Tomography (CT), Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT)



Dr Robin Holmes of University Hospitals Bristol Foundation Trust has been developing the use of 3D printers to produce low cost, anatomically correct brain phantoms for testing Positron Emission Tomography (PET) and other scanners.

and medical ultrasound. The CT and MRI pioneers Godfrey Hounsfield and Peter Mansfield received Nobel prizes for their work, while ultrasound pioneer (and former IPEM President) Peter Wells was recently awarded a Royal Medal by the Queen.

Intensity Modulated Radiotherapy (IMRT) is an advanced form of cancer treatment, which precisely targets radiation at the tumour, while minimising the amount going to surrounding healthy tissues. Medical physicist and IPEM Fellow, Professor Steve Webb, was one of the key researchers behind its invention. The use of IMRT is now rapidly expanding across the NHS, with the help of the Government's Radiotherapy Innovation Fund.

Medical physicists have been vital to implementing this new technology safely and are now developing new and improved treatments, made possible by IMRT.

Biomedical and clinical engineering is one of the fastest advancing areas of healthcare science, covering areas such as medical implants, joint

commercialised, enabling thousands of users worldwide to perform delicate, individual finger movements and complicated grips not possible with previous prostheses.

Medical innovation is not all about ground-breaking developments and Nobel prizes. NHS physicists and engineers are constantly finding creative

elsewhere. Four of our projects are outlined in the box below. They provide a snapshot of the wide range of research and development undertaken by our members and the considerable improvements it can bring to patient outcomes, cost effectiveness and quality assurance.

Physicists and engineers represent a rich scientific resource embedded within the health service. In these increasingly demanding times, the pioneering advances they deliver, working with doctors and other healthcare staff, are vital to help the NHS keep its world-leading position.

... non-invasive optical techniques ...

replacements, robotic surgery, rehabilitation devices and tele care. The world's first fully articulated bionic hand was invented by NHS clinical engineer and IPEM Fellow, David Gow, who was recently appointed CBE for his work. His revolutionary, modular design for the i-Limb has been successfully

solutions and new approaches to deal with everyday challenges to effective patient care. Since 2012, IPEM's Research and Innovation awards have been providing small grants for such front-line work and especially for early-stage, speculative or niche research projects that would struggle to find funding

FOUR RESEARCH PROJECTS ASSISTED WITH IPEM FUNDING.

1. Quick and accurate mapping of skin cancer lesions

Megan Duffy is one of a team of scientists at St Thomas's Hospital, London developing a new technique that could enable skin cancer tumours to be mapped accurately, quickly and cheaply for the first time. They are using advanced non-invasive optical techniques to detect cancer-affected areas under the skin and accurately map them before surgery. The system will help surgeons remove all the cancerous tissue from a patient whilst minimising skin damage and disfigurement. The new technique will be a huge improvement over existing practice, which requires taking repeated cuts of tissue from the patient's skin for microscopic examination. It is expected to cut operating times dramatically.

2. Better brain scans with the help of 3D printers

A wide range of illnesses and conditions are detected or assessed with the help of medical scanning. Medical physicists use test objects called phantoms to check that the scanners are operating correctly. This is important, in order to ensure that any potential abnormalities detected are real and not due to variations in scanner performance. Dr Robin Holmes of University Hospitals Bristol Foundation Trust has been developing the use of 3D printers to produce low cost, anatomically correct brain phantoms for testing Positron Emission Tomography (PET) and other scanners. With better phantoms, scan reporting for conditions such as neurodegeneration will become more objective and accurate, reducing uncertainty and enabling earlier diagnoses.

3. Safer seatbelts for passengers with spinal deformity

There are currently no car passenger restraints on the market designed specifically for those with severe or complex spinal deformities. Paul Harrington of the Oxford University Hospitals NHS trust has been developing car restraints for better protection of wheelchair users. He has designed and tested a wheelchair-integrated system which incorporates both a lap belt and an upper torso restraint. Recent crash tests have found that his new system provided better protection and met international safety standards regarding the level of restraint provided. Paul is now developing a commercial product with a manufacturer.

4. Wider access to self-administered pain relief

When patients are allowed to administer their own pain relief, it has been found to reduce the requirement for costly nursing and to be more effective at relieving pain. However, an estimated 20% of patients who would benefit from Patient Controlled Analgesia (PCA) are physically unable to operate the handsets. Dr Thomas Stone and Sonya Sireau of Addenbrookes Hospital, Cambridge, working with Ian Hosking of the Cambridge University Engineering Design Centre are developing several different PCA handsets for disabled patients. They believe that, with the right devices, almost every patient should be able to access PCA. Their first prototypes are now being tested with patients.

POWERING HUMAN PROGRESS – PAST, PRESENT AND FUTURE



Ian Marchant FEI, President, Energy Institute

In 2014, the Energy Institute (EI) celebrated its centenary as the professional body for anyone working in or studying energy, and this milestone has provided us with an opportunity to reflect on how energy has contributed to human progress over the past century, as well as take a hard look at future challenges.

Energy has always been a key enabler of economic development, but it has also shaped today's society. The world looked very different in 1914 and energy has been at the forefront of this change. It has transformed our existences and the towns, cities, countries in which we live. It has been fundamental to improving comfort in the home, efficiency in our work and diversity in our leisure time. It has played a major part in improving the health of individuals and nations. In 1914, in the UK alone, 63% of people died before the age of 60. Now it is less than 12%.

Energy has also turned the planet into a global village, providing access both

used as the quickest means of bringing news. Now we can instantly contact people around the globe, whilst the development of the internet enables us to share events on a global scale and in real time.

... we can instantly contact people around the globe ...

None of this could have been possible without the growth of the energy sector to power it all.

POWER TO THE PEOPLE

However, to continue this progress for the benefit of society, we will have to overcome very complex challenges. Barely a week goes by without some aspect of energy making headlines, as

cause adverse consequences on the others. Reconciling these needs for sustainability, security and affordability is the "energy trilemma" that the industry has been tackling for some time now and that all stakeholders must resolve.

With climate change considered to be one of the greatest threats in human history, extensive research must be continuously undertaken and technical developments deployed to produce new and cleaner energy – and there should be enough of it to provide uninterrupted supply for decades to come. The cost of generating this energy must also be controlled to ensure that people can comfortably integrate its use into their daily lives.

But there is still another huge challenge for the industry to meet: that of providing for the one billion people in the world who still lack access to clean energy, which has become an essential commodity alongside food, water and shelter. Back in 1914, the global population was estimated at 1.8 billion. Today it stands at 7 billion and the forecast is for the world to hit

... Energy has always been a key enabler of economic development ...

geographically and through communications to every corner of the world and beyond. It has been instrumental in bringing technological change on the ground, in the air and into space, enabling us to travel faster and further, reaching new frontiers well beyond our grandparents' wildest dreams. When the EI was created, the use of telephones was in its infancy and telegrams were

politicians, regulators and the business community grapple with three objectives that frequently pull in different directions: energy costs need to be low for both businesses and families; energy supply needs to be secure for the economy and social wellbeing and it needs to be sustainable to safeguard the environment. These factors frequently conflict and decisions designed to achieve one can

11 billion inhabitants by 2100. Not only must the energy industry work tirelessly to help create a more secure and sustainable environment for people to live in, it has to do so for everyone.

POWER FROM THE PEOPLE

We generally think of energy as a natural resource, but it requires considerable human

sector's history is full of heroes: the well-known such as James Watt, Thomas Edison and William Armstrong, but also many unsung ones. Every day, a whole range of energy professionals do amazing things, from fitters on a North Sea oil rig and linesmen out in all weathers keeping the lights on, to engineers solving today's problems and scientists working on tomorrow's. Organisations such as the EI, as

on people development, providing the skills and knowledge needed for individuals to achieve the highest level of competence in their field. Access to energy and the human progress that it generates relies on these highly skilled people whose dedication to the task not only helps sustain society but also inspire new generations to join the sector.

Professional bodies also play a key part in encouraging debate about the challenges facing industries and society. Those debates in the energy sector are as fierce, relevant and difficult as they have ever been. As an independent organisation bringing sound science and evidence-based knowledge to the table, as well as developing

operational good practice in partnership with industry and regulators, the EI acts as a convening authority to stimulate an open and informed debate about trade-offs, conflicts and technologies, and we can help develop a better understanding of the energy industry as a single integrated system. If our predecessors who gathered 100 years ago to start this work were around now they would be amazed at the way energy has transformed so many aspects of our lives for the greater good. They would be impressed with the technological advances that have been achieved and the wellbeing that these have brought.

I hope the same can be said in another 100 years.

www.energyinst.org.

*... whole range of energy professionals
do amazing things ...*

ingenuity to find it, extract it, distribute it, deploy it and manage its use. Throughout the last century, the development of 'human capital' has taken central place in everything the energy industry has done. Our

well as governments, businesses and academic bodies, have a key role to play in helping, encouraging and recognising these energy heroes.

Much of the focus of any professional institution is, rightly,

ENERGY INSTITUTE CELEBRATES CENTENARY AT PGES SUMMER RECEPTION

Throughout last year and until March 2015, the Energy Institute (EI) has been celebrating 100 years since its founding organisation the Institution of Petroleum Technologists was formally launched by its first President Sir Boverton Redwood.



Sir Boverton Redwood



(l-r) Ilan Liddell-Grainger MP and Katrina Williams join EI President Ian Marchant FEI and EI Chief Executive Louise Kingham OBE FEI in celebrating the Energy Institute's Centenary

To mark this milestone, the EI sponsored the 2014 Parliamentary Group for Energy Studies summer reception, hosted by Ilan Liddell-Grainger MP and featuring Katrina Williams, Director General for International, Science and Resilience at the UK's Department of Energy and Climate Change and EI President Ian Marchant FEI as keynote speakers.

Annual Luncheon of the Parliamentary and Scientific Committee

The Guest of Honour at the Annual Lunch on Wednesday 26th November was the Prime Minister, the Rt Hon David Cameron MP.

"The first thing I want to say is to wish you a very Happy Birthday. You've done extremely well to keep going in Parliament for this many years and you've had an extraordinary impact on Parliament, so Happy Birthday and thank you for what you have done.

I should start with an apology because I am an Arts Graduate so I feel a bit of a fraud. The only science I did was one of the dismal sciences – reading Politics Philosophy and Economics at Oxford so I'm not sure I am really qualified.

I want to make a couple of points. The heritage we have in this country of science is something we should be



Lord Oxburgh and Andrew Miller MP



Andrew Miller MP, Stephen Mosley MP, Rt Hon David Cameron MP, Lord Oxburgh and Dr Stephen Benn

incredibly proud of. Think of the inventions – everything from the world wide web to penicillin, to the jet engine, to the television, to the Higgs Boson, to the unravelling of DNA – we have an incredibly proud science heritage.

But the real reason I wanted to come and say a few words is that I think science is going to be even more vital to our future than it has been to our past. We have to compete with other countries for our share of success in the world. The only way you win a race is to play to your strengths. When you think what Britain's strengths are – we can all name a few, apart from our weather and our ability to lose at sports we invented. We have the English language, we have got our great Universities, our tradition of finance and trading around the world but

one of our greatest strengths is our science base, and our ability to go on pushing the boundaries, inventing and exploiting science.

I see this as a key part of our future and the work that you do to connect Parliamentarians to science is vital. That is the most significant thing I want to say. I see this as a very important part of what we do. That is why we have not cut the Science Budget; we have increased it. That is why we are investing in science in our schools and encouraging people to study STEM subjects. That is why we are looking at how to improve the teaching of science, not least computer sciences. Teaching coding in our schools is vitally important. This is vital to our future. Keep on doing what you are doing.

The second point is there is something I want you to help us with. There is a danger in our country and across the European Union. We can sometimes let an anti-science culture grow up. We see this in all sorts of different ways. We are at the forefront of making sure that we cure genetic diseases by having a permissive regime by looking at stem cell and other sciences.

Nuclear power is a vital scientific area of endeavour, a vital industry for our country, but I sit at those European Council meetings and I see country after country, including now, sadly, Germany, arguing against nuclear power.

I don't like the word fracking, I prefer "unconventional gas", but we should be doing all we can to make sure we recover

unconventional gas as well as conventional gas. Again we face a slightly anti-science culture in Europe when we try to do it.

The fourth area I would mention would be GM. We have some of the finest areas of scientific endeavour in terms of making sure that we can feed a planet of what will one day be 9 billion people. Again there is a slightly – very – anti-GM culture sometimes in Britain but a lot in Europe.

I've named four areas. You are scientists. You can name a lot more where we need to take on the doubters, and often some who are actually quite ignorant about these issues and really make a campaign and have a fight about it.

Science is essential to our future. Keep doing what you are doing and help us win the battle in arguing for scientific advance. Politicians cannot do it on our own. We need scientists,

universities, professors, researchers to step up to the plate and make the argument too – otherwise the argument on nuclear, on GM, on unconventional gas on embryology will all go the wrong way.

I hope you have a lovely lunch. I am sorry to tell you that as soon as you have finished your



Ian Taylor and Rt Hon Lord Jenkin of Roding



Professor Peter Silley and Dr Lucy Harper

lunch you've got to get back to work. The point of Committees like this is to have a forward-looking agenda and I hope I've given you an idea of what I think that agenda needs to be: take on the doubters, take on the arguments, win for science and you'll be winning for Britain as well. Thank you very much indeed."



Sir William Stewart and Dr Richard Worswick



Marijke Smith, Tony Harding and Andrew Furlong



Lord Kirkwood and Lord Walton of Detchant



Can consistent apprenticeship experience be achieved to drive performance excellence?



Professor Sa'ad Medhat
CEng FRSA FIKE

Professor Medhat is the founder & CEO of NEF with an established reputation for driving forward initiatives from policy through to implementation.

WHAT IS THE ISSUE?

The Heseltine Report¹ made it clear: we need to achieve the highest standards in education to raise our game on socio-economic prosperity. The message from the Richard Review² is that apprenticeships are no exception to this. They need to set higher standards so that they are held in high esteem by employers, apprentices and society at large. Major reforms have followed from the Richard's Review. However, the issue that remains is that of consistency in the quality of the apprentice's experience. Theoretically, it should make no difference as to whether the apprentice has gone to a large or small company. The apprenticeship programme should be designed in such a way as to provide an experience that is consistent and impactful, irrespective of employer size or industry sector. In practice, the quality of the apprentice's experience is highly variable, and consequently may have a negative impact on the individual apprentice, and also on the sector and the economy as a whole. In addition, if the intention is to create

a robust educational alternative through a workplace route, then the apprenticeship standards should enable progression to first degree or postgraduate level that have parity of esteem with their academic counterparts.

WHAT IS NEEDED?

Beyond what the apprenticeship frameworks prescribe at different levels, there is no instrument to benchmark the consistency in the quality of the apprentice's experience. Research³ has demonstrated that the economies of the future will need workforces that offer higher functioning capabilities – digital, logic, design and interactions together with dexterity and sensory skills; ability to operate in different sectors; adaptable to technological change and possessing entrepreneurial mind-sets. By having these capabilities, employers will achieve greater productivity and increased innovation. There are many excellent apprenticeship programmes that go a long way to meet these qualities. However, to ensure a strong foundation for the future economy, these exemplars need to become the norm and not the exception. The only way to achieve this successfully is through providing a structured, coherent and consistent learning experience for the apprentice benchmarked to the highest standards globally.

THE APPRENTICE ASSURED

Building on NEF's extensive experience in developing quality standards and conducting assurance in multiple sectors (eg education, nuclear, construction, engineering, defence, energy, life sciences), NEF has designed a unique, new standard that assures the consistent quality of the Apprentice's experience – the Apprentice Assured.

The Apprentice Assured uses a six-category Framework to assess the apprenticeship quality. The Award is for the employer. The focus of the Framework is on the learner experience: how far is the apprenticeship geared to qualifying the apprentice to be of real value to an employer? Is the apprentice of value not just to the employer but to the wider industry? This is a chance to avoid apprenticeships that are an exercise in certifying – by box-ticking, taking the 'route one' approach to obtaining funding and hitting targets at least cost.

The Apprentice Assured Framework categories are identified in Figure 1:

A sample of the type of questions that the Apprentice Assured Standard tests for include:

- Is the Apprenticeship designed to deliver the impacts?
- Does the Apprenticeship programme plan the experience so as to maximise learning?
- Is the purpose of the Apprenticeship clear to the learner?
- Does the training provider and the employer understand their roles and act on these?
- Are learning experiences structured to provide a coherent curriculum of a consistent high standard?

- Do apprentices understand the demands of their industry and customer needs?
- Do apprentices develop high-value transferable and cross-sector skills?
- Does the apprenticeship encourage innovation, creative problem solving and design?
- Does the apprenticeship encourage commitment to professional recognition?
- Are the intended impacts achievable, add value and improve performance?

The development of the Apprentice Assured Standard is supported by the members of the Innovation Council of over 40 chief officers from different industry sectors of the economy. They act as members of the independent validation panel as part of the assurance process to enable not only objectivity in the assessment, but also to encourage the transfer of sector-to-sector best practice.

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- 1 No Stone Unturned in pursuit of growth Oct 2012.
- 2 The future of apprenticeships, Nov2014.
- 3 Workforce 2020, Building a strategic workforce for the future, Oxford Economics 2014; Global Human Capital Trends 2014, Deloitte 2014; Inventing the Future: Transforming STEM Economies, NEF 2014.

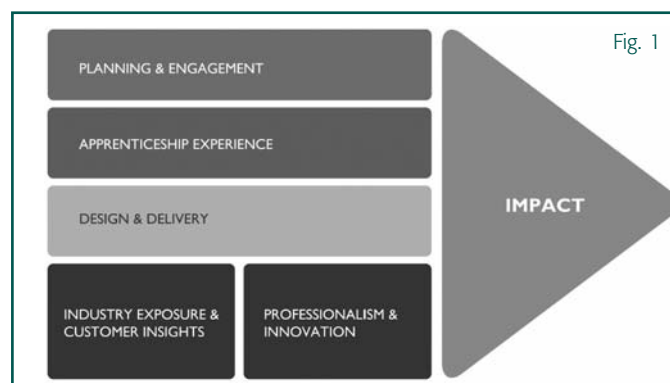


Fig. 1

CLIMATE CHANGE, FOOD SECURITY, AND BIG DATA



Irina Calos
Science and Innovation Officer,
Los Angeles

Without significant advances in agricultural technology, the American agricultural sector and associated jobs are at risk due to threats presented by climate change. However, recent advances in the use of data analytics for agriculture and research partnerships spell promise for the sector.

More than 21 million Americans – 15 per cent of the total workforce – produce, process, and sell the nation's agricultural goods, which contributed over £500 billion (\$776 billion) – 4.8 per cent of the nation's GDP – to the US economy in 2012. According to the US' National Climate Assessment released in May, climate disruptions to agriculture have already begun. For example, higher night-time temperatures have reduced maize yields, and the number of such hot nights in these regions is projected to increase by a further 30 per cent. Furthermore, climate change is already reducing rainfall in much of the country's thirsty agricultural regions. In addition to the primary stress of warming temperatures, livestock and crop

production are particularly vulnerable to climate change and secondary impacts such as pathogens, pests, weeds, drought, and catastrophic weather. Given that agricultural operations often have very low profit margins and farmers cannot just pack up and move, both the public and private sector have renewed their focus on helping the agricultural sector to remain productive.

Securing funding for climate change mitigation is notoriously difficult in the US, but Federal and private programs are finally working on empowering the agricultural sector to adapt to climate change and ensure continued food and financial security. By providing access to open climatological and agricultural data, the Federal government is encouraging partnerships between the government, private industry, and agriculturalists. Through its Open Government Partnership, the US Federal government is working to connect independent stakeholders to harness open data on www.data.gov to inform agricultural production to increase food security.

In July, the President unveiled the Climate Data Initiative's Food Resilience Theme, which is leveraging the government's open data resources to stimulate innovation and entrepreneurship that can empower farmers and make food systems more secure. With the launch of the Theme, the White House announced a number of commitments between US Federal agencies and the private sector to support food resilience using public data.

Because climate change increases weather variability and

risk to farmers, industry are increasingly interested in using data to aid farmers. In 2013, Monsanto, a large agrochemical and agricultural biotechnology company, acquired Climate Corporation for nearly \$1 billion. Climate Corporation's 200 scientists work to improve weather analytics to help farmers avert weather-related losses, providing weather, soil, and crop data at the field level directly to farmers through a smart phone app. (The US is certainly not alone in this field – the British Geological Survey's mySoil application similarly uses location-based data to help farmers optimise their production.) IBM and Intel also have weather analytics units working on everything from reducing water usage, maximising production, and minimising environmental impacts.

There are a number of opportunities – and reasons – for UK stakeholders to engage with the US to improve food security. The Global Alliance for Climate-Smart Agriculture, of which the US and UK are both founding members, seeks to promote greater international engagement on reducing agriculture's impacts on the climate. The Agricultural Model Intercomparison and Improvement Project works to improve climate and economic modelling with agricultural data.

The US is certainly not alone in its efforts to harness big data to comprehend better agriculture's evolving needs. This year the Science and Innovation Network in the US launched a UK-US task force in partnership with the Research Council's cross-council initiative on Global Food Security

to conduct in depth analysis of plausible worst case scenarios of disruption to the global food system caused by extreme weather events. In October, the Met Office committed £97 million to developing a new supercomputer for highly accurate weather forecasting and climate modelling academic research. The Food and Environment Research Agency has also paired with the University of York's York Environmental Sustainability Institute for Fera's Initiative in Agrifood Resilience. Under the UK's Strategy for Agricultural Technologies the UK Government committed £90 million to establish a number of Centres for Agricultural Innovation, which will launch in 2015. The first Centre will be a £10 million Centre for Agricultural Informatics and the Metrics of Sustainability. The UK Government committed a further £70 million to establish an Agri-Tech Catalyst. The Catalyst supports collaborative research between scientists and businesses to springboard agri-tech projects from the lab to the market place and drive agricultural innovation. To date, over 50 projects worth £43 million, which includes £13 million co-investment from industry, have been supported.

With the needs for adaptation to climate change growing ever more acute, the "big data revolution", as many call it, can't come too soon. However, recent advances in computing and nascent partnerships between national and international stakeholders lend hope to the idea that the agriculture sector will continue to innovate.

UK & BRAZIL: PARTNERS IN SCIENCE, SPACE & INNOVATION



Dr Julia Knights
Director of Science and Innovation
Network (SIN) – Brazil

If you would like to receive our monthly newsletters, produced jointly with SIN Mexico and SIN Chile, please don't hesitate to get in touch at Julia.knights@fco.gov.uk

Deep beneath the Andes an underground lab is being constructed to detect dark matter. Agua Negra Deep Experiment Site (ANDES) is a joint project between Brazil, Chile, Argentina & Mexico and is due for completion by 2021.

Less than three degrees from the equator, the Alcântara Launch Center sits on Brazil's northern Atlantic coast. The earth spins fastest here so less fuel is required for launches, making it an attractive prospect for UK satellite launches for communication.

In Rio de Janeiro, a vaccine aimed at protecting against Schistosomiasis – the most devastating parasitic infection in the world after malaria – is being developed by scientists at the Oswaldo Cruz Foundation.

These are just a few of the exciting innovative projects of the UK's Science and Innovation Network (SIN) in Brazil. Based in the British Embassy in Brasilia

... one of the world's science powerhouses ...

and the British Consulate in Sao Paulo, SIN Brazil fosters world-class science partnerships with Brazil whilst informing UK stakeholders of new science policies, funding mechanisms and opportunities for research and commercial partnerships with Brazil.

BRAZILIAN GOVERNMENT INVESTMENT IN SCIENCE

Brazil is rapidly becoming one of the world's science

powerhouses. Federal and State Government spending on Science, Technology and Innovation in 2013 was estimated to be around \$31 billion USD, amounting to around 1.2 % of Brazil's GDP.

... opportunities for UK business and academia to offer expertise ...

In 2013, Brazil published 46,306 articles in Elsevier scientific journals, representing more than two-thirds of South America's entire research output. The impact and quality of Brazilian research is world-class in many areas, with citations three times greater than the world average in Agricultural Sciences (8.8% of the world scientific output), plant and

animal science (6.6%), environment and ecology (3%), and biology and biochemistry (2.6%). Pockets of excellence are also emerging in avionics, engineering and oil and gas.

However, the country still faces a number of challenges including a lack of research scientists and engineers, a need for expertise in innovation, and a legal and commercial framework to support it with IP law

enforcement. Links between academia and industry are still in the early stages of development. These are all opportunities for UK business and academia to offer expertise.

The Brazilian Government is investing heavily in Brazilian industrial development and developing a skilled labour force. President Dilma Rouseff has increased the powers and funding of FINEP, the Brazilian equivalent to Innovate UK. In June 2014 she launched the £5 billion "Knowledge Platform National Program" over ten years that will invest in research on health, oil, basic engineering, robotics, monitoring technology for the Amazon rainforest, genetics and biotechnology.

This rapidly developing landscape provides significant opportunities to further UK-Brazil science and innovation co-operation as well as commercial opportunities for British institutions and companies.

BRAZIL'S NEW SCIENCE MINISTER

Space and Innovation are the new priorities for Brazil's new

Science, Technology and Innovation Minister, Aldo Rebelo, who took office at the beginning of this January. Rebelo, a long standing member of the Communist Party of Brazil, was Sports Minister for the FIFA World Cup 2014 in Dilma's last government. This brings the Science Ministry greater political importance as his party has been loyal to the coalitions in power since 2003.

OPPORTUNITIES IN SPACE

Brazil is a key place to launch satellites thanks to its main

... creating five new launch pads ...

launch facility, Alcântara Launch Center. Several Space superpowers are already partnering with Brazil's Space programme. China launched a \$250 million Earth Resources Satellite last November joint with Brazil, with another launch due 2017. Russia and Brazil are designing a family of next-generation rockets and creating five new launch pads as part of their Southern Cross Project. Their first rocket will launch in 2022.

The Science and Innovation Network (SIN-Brazil) will create new partnerships to increase sales of small satellites and launch satellites such as Cubesat on existing missions from Alcântara. We will do this by encouraging UK companies to apply for grants from the UK Space Agency's new £32m International Partnership Space Programme. Brazil is also due to host the Disaster Charter Organisation in Autumn 2015.

We will use this to showcase UK expertise on disaster monitoring with the UK's Satellite Applications Catapult and the Space Agency.

OPPORTUNITIES IN INNOVATION

In partnership with UKTI, SIN has increased dialogue with different levels of the Brazilian government on innovation policy, working on sharing best-practice and increasing the dialogue with key local partners to influence policy-making. This includes the Brazilian Innovation Agency, the Brazilian Ministry of

Development, Industry and Foreign Trade, and State and Municipal governments in Sao Paulo. We have also used recent recognitions such as the UK's second place in the Global Innovation Index to foster interest in large Brazilian innovative companies looking to carry out R&D in the UK.

In 2014 we have seen an increased interest and investment of UK universities and research centres in Brazil. The University of Edinburgh and King's College London opened local offices in Brazil in 2014, joining Universities of Birmingham, Nottingham, De Montfort and Cambridge Assessment with a presence in the country.

Strong opportunities in biotechnology exist for UK companies. The UK's biotech firm Oxitec of Oxford opened the first factory producing transgenic mosquitoes in

Campinas last year. The mosquitoes are designed to control against dengue fever and the Chikunguna virus. Oxitec began as a start-up at Oxford University and SIN-Brazil facilitated its internationalisation and development in Brazil.

... producing transgenic mosquitoes in Campinas ...

UK BRAZIL £27M NEWTON FUND PROJECT

SIN Brazil is also developing Innovation partnerships in health, future cities, neglected diseases, biodiversity and climate through the UK's £27m Newton Fund (Overseas Development Assistance funding). Launched by the Chancellor last year, we have secured a further £27 million from the Brazilian government. To date, five new innovation calls have been successfully launched in 2014.

Exciting examples include digitising the entire Brazil plant collection held at the Royal Botanical Gardens at Kew for the benefit of Brazil. Partners involved in digitising the collections include the Rio

... specimens collected by Charles Darwin ...

Botanic Garden, the Brazilian National Research Council and Brazilian universities. The Re flora project, as it is known, includes specimens collected by Charles Darwin and will not just benefit Brazil but also future generations around the world.

A £6m joint research call between the Research Councils UK and the Brazilian Council of State Funding Agencies attracted four times the number of bids

that could be funded, revealing the strong interest on both sides. Seventy projects on health, future cities, biodiversity and economic development and welfare reform will be funded in 2015. Three further calls for 2015 are under way including a

£3 million joint call on energy, waste and water between Innovate UK and the National Service for Industrial Training in Brazil. SIN-Brazil will continue to help negotiate new calls between Brazilian partners and the UK's Newton Fund delivery partners (RCUK, British Council, the Academies and Innovate UK).

SCIENCE WITHOUT BORDERS

Further innovation partnerships are being fostered through Brazil's Science without Borders mobility programme. The UK has also welcomed over 8,500 students under "Science Without Borders", Brazil's education mobility scheme. A third of these students are already on a research or industrial placement

in the UK, paving the way for future innovation collaborations. The Brazilian government is keen to send more students on courses that offer placements, so the UK government and Universities UK are working with British companies to make this possible.

ROYAL SOCIETY PAIRING SCHEME



Professor Ruth Aylett
Professor of Computer Science,
Heriot-Watt University

Every year the Royal Society arranges partners between parliamentarians and civil servants with scientists. Its annual Pairing Scheme starts with the 'Week in Westminster' in late November, a programme of activities for the scientists including seminars, workshops, shadowing opportunities and a tour of Westminster. The week gives the scientists a taste, not only of the approach to science policy, but of Parliament and the Civil Service in general.

As a researcher in artificial intelligence and robotics, and a Professor of Computer Science at Heriot-Watt University in Edinburgh, I am often frustrated by public perceptions of my area. These seem often driven by wildly sensationalist media publicity for ideas such as 'robots will take over the world' or The Singularity, after which artificial intelligences will keep humans as pets, if we are lucky.

I was paired with Ian Murray, the Labour MP for Edinburgh South, who went into Parliament at the last election after working in a variety of small businesses. He is part of the shadow BIS team, the new name for what I remember being the DTI at one point, and thus the department responsible among other things for research funding, higher education, and technology-transfer programmes.

politician's timescales. Ian gets 700 emails a day, and though he now has a clerical assistant helping him to deal with them, it is clear he doesn't have very much time for mastering new materials. Moreover there is zero training for MPs, so picking things up as they go along seems very much the rule.

Ian was very committed to the pairing exercise and took me everywhere he went, though understandably there were a couple of private meetings I couldn't attend. I did however witness an informal meeting with a couple of managers from the Post Office in the Portcullis House canteen. Ian is concerned that the Royal Mail sell-off could result in total destabilisation of the Post Office, which was not part of that sell-off, and along with the managers, was examining new activities that might help Post Offices succeed.

Prime Minister's question time was just as much a circus from

... Westminster makes you think of a museum ...

This was one motivation for applying to the Royal Society Pairing Scheme, in which scientists are linked to MPs or civil servants. What if policy was made on the back of such inaccurate ideas? What if real issues of privacy and security already visible in the use of AI technologies on the web were to be ignored in favour of these improbable fantasies? And so in November 2014 I watched the Northumbrian coast go by as my train took me to London for a week in Westminster.

If you are used to the Scottish parliament in its nice new building with electronic voting and high-tech desks for MSPs to sit at in the debating chamber, Westminster makes you think of a museum. Of course it is also a workplace.

I met Ian on the Tuesday of my week in Westminster outside the Millbank Tower, where he was deputising for a colleague at a technology transfer event. This was a conference run by a North-East-based tech transfer company called CPI (Centre for Process Innovation), who as their name suggests, specialise in process industry technology. Ian took this on at short notice

... there is zero training for MPs ...

and as a result was presenting a speech written by his colleague, who'd been called away from London unexpectedly.

This need to react and perform off-the-top-of-the-head seems not untypical of an MP's life, and underlines how hard it is to mesh the academic's and the

the Visitor's Gallery as it looks on television. Ian felt that, oddly, all the MPs know how bad this looks to the general public, but it goes on anyway. He was down to ask a question in the session, which moved with bewildering speed, like much parliamentary activity.

The Commons Select Committee on Science was more tractable an event for an academic, as MPs interviewed witnesses in some depth, in this case on biometric technologies. I wondered how they managed to ask sensible questions – remember, no training – but the MPs at this session seemed very conscientious and did a reasonable job. Acting as an

... they had been using photocopied maps ...

expert at a select committee is certainly one way of bringing science into the decision-making processes, though it was less clear how one would get to be called as an expert. Opportunities are apparently advertised somewhere, but

maybe one has to follow some page on the Government website to see them.

On our final day, GO Science – the Government Office for Science – presented their mechanisms for scientific advice in crisis situations. We worked through a group-based exercise around the floods of early this year, and with my IT hat on I was astonished – and not in a

good way – that they had been using photocopied maps as a way of representing key data. But lessons can be learned just as quickly as everything else it seems, since now there is a quite reasonable GIS system for use in the next such crisis.

A fascinating week, and a lot learned. Whether I can put any of this to practical use remains to be seen: for an individual scientist to have much effect on the political dramas of Westminster seems about as easy as jumping through a door in a fast moving train. Still, one of the things I learned was that as well as GO Science, and the select committees of the two Houses, there is also a Parliamentary Office of Science and Technology – POST – that serves the parliamentarians at large. They produce POST Notes on specific topics, and so I emailed them suggesting one on AI and Robotics.

A few weeks later one of their team gave me a ring – it turns

out that their Board meeting early next year will indeed consider such a POST Note as one of various possibilities. We had a long chat about what such a Note might cover, and if it does happen then I would be able to feel I had some small effect on the process. My pair Ian Murray will come and see our Robotics Labs in February, and hopefully this will build a longer-term relationship: assuming that is, he is re-elected in May. Time horizons look very different for an MP than for a scientist – and that is the challenge for more lasting meetings of minds.



Ian Murray
Member of Parliament for
Edinburgh South and Labour's
Shadow Minister for Trade and
Investment

This is the third year I have participated in the Royal Society's Pairing Scheme and, yet again, it was a hugely rewarding experience. It's a very important scheme and one that I would encourage my colleagues to take up in the future. Indeed, it's incumbent on all elected representative to be better informed about science issues and to encourage scientists to understand how they can influence science policy.

This time, I had the pleasure of pairing with Ruth Aylett,

Professor of Computer Science at Heriot Watt University in Edinburgh. I have to admit that I didn't know much about Ruth's area of expertise prior to meeting her. The extent of my engagement with robots and artificial intelligence was only on the cinema screen so it was excellent to be able to learn more about her area.

Science usually meanders low under the national politics radar. We must recognise that it should be placed at the centre of our debates. We need to understand that the decisions government and elected representatives make in the lobbies of the House of Commons have a direct impact on the development of our science sector, and in turn the things those scientists and researchers can contribute to the lives of our constituents.

Nothing encapsulates that more than the story of Alan Turing and his team, and the pivotal part they played in the war effort. This saw the application of science hand in hand with the

shocking realities of geopolitical realities of the time to break the "unbreakable" enigma code. It is said that their work contributed to the shortening of the war by two years, possibly saving millions of lives. A mathematician, logician, computer scientist and Royal Society fellow whose influence came to bear far beyond the realm of his fellow scientists. Just think – where would be today without 'Turing's Machines'?

... Science usually meanders low under the national politics radar ...

or the field of artificial intelligence? The debt of gratitude he is owed makes it all the more horrifying that he was treated so inhumanely.

My involvement in the scheme over recent years has made me value the link between science and politics. But we need to make it stronger. MPs and scientists have a responsibility to engage with each other to get the best possible scientific advice into public policy making.

We both have the responsibility to promote dialogue, engagement and – hopefully – respect and understanding between politicians and scientists.

As an MP who represents the University of Edinburgh King's Buildings and the Research Centres at Little France I take a close interest in the Pairing Scheme. It is thoroughly enjoyable and increased my knowledge of key scientific areas

in the last three years from Carbon Capture and Storage to artificial intelligence. As a Shadow Business Minister it has also been very useful to see the contribution science makes to the UK economy and why it should be supported by Government.

I hope to visit Ruth at Heriot Watt in the near future so that I can get further insight into her work – I'm sure there will be a lot to learn.

DOES THE UK HAVE THE INFRASTRUCTURE IT NEEDS?

Meeting of the Parliamentary and Scientific Committee on Tuesday 21st October

DOES THE UK HAVE THE INFRASTRUCTURE IT NEEDS?



Nick Baveystock,
Director General, Institution of
Civil Engineers

Nationally significant infrastructure projects are, by their nature, political and subject to a decision making process, with public and parliamentary involvement. This will become increasingly difficult as we are faced with challenges such as climate change, which will necessitate choices over the resilience of infrastructure, and population growth, which will place greater demand on our vital networks.

ICE launched its *State of the Nation: Infrastructure* report in June 2014, which assesses the condition and capacity of the UK's economic infrastructure, its level of resilience, the governance and regulatory arrangements in place and investment and funding issues. Our report found that the UK's infrastructure requires attention – and raised the question of whether the UK can afford the infrastructure we want, 24 hours a day, 7 days a week, 365 days a year.

FUNDING AND FINANCING

We need to decide what we can afford. Infrastructure is an enabler, not an end in itself. Too often, policymakers are more concerned with specifying an input, rather than an outcome: “I want a bridge”, rather than, “I want to get goods from A to B.” If we can create less, better infrastructure then we can provide greater value for money.

We need to build more efficient, smarter infrastructure, but we also need to fund it somehow – either through tax or user charging. The balance is a choice for the Government of the day. Irrespective of where it comes from, funding is limited and decisions on where resource is directed must be aligned to our strategic objectives. Investment requires a return. Without investment, we can neither build infrastructure, nor maintain what we already have. Although investment in infrastructure has slightly

increased recently, it remains low compared with other developed countries.

The Autumn Statement highlighted that the next Government will have to reduce public spending even further. This means less money for government departments and local authorities, which means less money for infrastructure. This will increase the need for private investment and enhance the Government's role in reducing risk for investors through stable, long term legislation and regulation. Otherwise investment will find a home elsewhere.

SECTORAL CHALLENGES Energy

Significant quantities of the UK's existing electricity generation capacity will retire soon, with major implications for security of supply unless the conditions to attract investment in new generation are provided. This is exacerbated as the use of electricity for transport and residential heat increases.

The best way to meet demand is to reduce it through demand side management. With this in mind for the UK to meet its legally binding targets for decarbonisation beyond 2020, it must transform the way that it generates and uses energy. The UK is bound by domestic targets to reduce greenhouse gas emissions and, by EU directives, to reduce energy consumption and increase its share of renewables to 15% by 2020.

All of this has to be delivered in a way that is affordable to consumers. The National Audit Office report in 2013 estimates an increase of £221 in the average household energy bill between 2013 and 2030 in real terms.

The key to achieving this aim is for Parliament to continue to create the conditions to incentivise generation, maximise investor confidence and ensure sufficient capacity to meet peak demands. Thankfully we have now seen some progress through implementation of Electricity Market Reform. Policymakers also need to resolve political uncertainties around the lack of a clear decarbonisation target and the future of the carbon price floor.

Water

The pressures from climate change and population growth mean that water availability will be less predictable in the future. The manner in which water is abstracted and used will have to change.

The changing nature of weather patterns is also impacting on water availability. In the south east, we have a water scarcity issue while the area will see an increased demand from a population that is set to grow around 23% over the next 20 or so years. We also have an increasing demand from multiple users. Demand from electricity supply is the largest user of water. Domestic use comes second.

Management of water and its interdependencies with food, energy and the environment (including flooding) is vital for future water security. The Scottish Hydro Nation concept links the importance of water to economic and business growth. The Welsh government is currently developing a specific water strategy to link economic growth to water resource management. ICE recommends that Defra adopts a similar approach for England through the National Water Resources Group.

We have been left an excellent infrastructure legacy by the Victorians; however, leakage is still too high and the type of infrastructure we need to manage our water effectively is changing.

The strategic approach to flood management which has been established over the last two decades needs to be reinforced. This combines flood defences with management of fluvial and surface water flood risk, and upstream catchment measures to improve building and infrastructure resilience to floods.

Managing at catchment scale so that we can reduce and slow down the water actually getting into our sewerage systems can have a significant benefit. We welcome the Environment Agency (EA)'s catchment management pilots and hope that these continue to gain government support.

Flood management requires investment. This has been a particular issue in maintenance, where maintenance grants from

third of traffic and two-thirds of freight. More severe congestion is anticipated in the longer term as stronger economic growth returns alongside population growth.

Britain's rail network has seen a doubling in passenger kilometres over the past two decades, resulting in capacity constraints. Track and signalling faults continue to be the main sources of infrastructure-related delay.

products' usage – extracting maximum value, reducing waste and increasing reuse.

This change requires political leadership and we already see this in devolved countries; however, Government policy for waste is currently spread across a number of departments in England. We believe the establishment of an Office for Resource Management, situated within BIS, would show a clear

Table ES.1: 2014 Infrastructure pipeline, by sector, 2014-15 onwards

Sector	No of Projects	No of Programmes	Pipeline Value £bn
Communications	1	5	11.0
Energy	77	70	274.9
(of which Oil&Gas)	0	1	53.0
Flood	5	21	3.7
Science and Research	18	4	1.4
Transport	141	129	142.3
Waste	20	0	2.0
Water	1	59	30.9
Total	263	288	£466
(excluding Oil&Gas)	263	287	£413

Figure 2 – The updated National Infrastructure Plan pipeline (December 2014)

Severe weather incidents in the winter of 2013/14 emphasised the need for greater resilience.

Local transport governance is often weak and fragmented, with funding inadequate to deliver the system we need. Responsibility for most roads remains with local highways authorities, which in major urban areas are often small with shrinking budgets. Bus services are deregulated in most of the UK, albeit with major public subsidy.

ICE believes that city-regions are often the most appropriate 'larger than local' scale for understanding and managing travel behaviour, and the trend towards devolution to English city-regions should be accelerated.

Waste and resource management

The transition to a 'circular economy' requires a shift in the way we think of our waste – from the 'take-make-dispose' model to one that extends

indication from Government that we need to reduce waste and see it as a business resource.

CONCLUSION

In answer to the question 'Does the UK have the Infrastructure it Needs?', my answer is 'Not yet – but progress is being made.' Tough political choices lie ahead. Policymakers now need to ensure that the improved policy climate will translate into tangible impacts on infrastructure.

The second speaker at the meeting should have been **Charlotte Holloway**, Head of Policy, techUK; unfortunately she



was taken ill and **Professor Brian Collins**, Professor of Engineering Policy, Director, International

Centre for Infrastructure Futures, UCL, agreed to take her place two hours before the meeting.



Figure 1 – ICE's State of the Nation: Infrastructure 2014 sector assessment grades

What is needed now is a mix of supply side measures to improve resilience in the water sector, including interconnections between water companies, extra storage, from large scale reservoirs to small scale community storage.

Flood management

One key area of concern for ICE, and the one which highlights the vulnerability of all our physical infrastructure networks and assets, is in flood management and the need to build resilience into our infrastructure networks.

the EA will be 22% lower in 2014/15 than they were in 2010/11. While we now have a welcome long term capital commitment to flood projects, maintenance is lagging in terms of vision and importance.

Transport

Our strategic road, rail and air networks are capacity constrained at critical points, undermining their contribution to prosperity and quality of life.

The vast majority of UK travel is by road. England's strategic road network (SRN) constitutes less than 3% of total road length, but carries around one-

EBOLA VIRUS – AN UPDATE

Meeting of the Parliamentary and Scientific Committee on Tuesday 4th November

The situation in Africa (and the threat for the UK) persuaded us to organise a briefing meeting at very short notice. An early morning meeting was held on Tuesday 4th November, summarised below by Professor Alan Malcolm.

We were delighted to welcome:

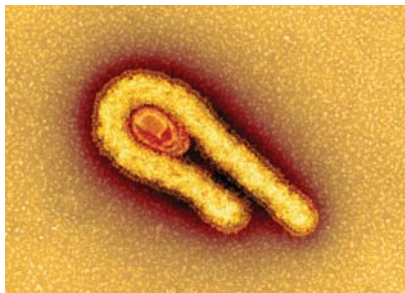
Professor Dame Sally Davies, Chief Medical Officer, England

Dr Christine McCartney (Director of Microbiology)

Dr Andrew Simpson, Public Health England

Professor John Edmunds, Dean of Faculty, Epidemiology and Population Health, London School of Hygiene and Tropical Medicine

Dr Huw Taylor, Professor of Microbial Ecology, University of Brighton



The following points were made in answer to questions from the audience:

WHERE HAS THE DISEASE EMERGED?

HOW WERE PAST EPIDEMICS ELIMINATED?

There is almost certainly an Animal reservoir.

This may be fruit bats or possibly monkeys.

Eating bush meat is a likely entry point into humans.

In the past such epidemics affected rural communities.

A combination of excellent public health, coupled with early diagnosis and isolation enabled the epidemics to be kept under control.

The difference here was that it broke out in a new part of Africa.

It took time to identify, by which time disease had spread.

There was also significant transmission in hospital.

The Reproduction Number is the number of cases which each patient then infects. For the current outbreak this is currently 1.4. Anything above 1.0 is worrying.

Isolation is easy if there are only a few cases, but very difficult if there are many cases.

Transmission then takes over.

A large part of the daily work of the CMO is myth busting. There has been far too much scaremongering. There is no need to cancel flights to affected countries, and indeed this would deny them access to skilled help, thus aggravating the situation. The affected countries have excellent exit screening, and the UK has appropriate

entry screening, together with follow up and monitoring where necessary. However all such surveillance is kept under constant review.

HOW DO YOU CATCH IT?

It can only be caught by intimate contact with bodily fluids, especially blood.

It is not airborne and as an RNA virus it will not mutate. It is not like influenza which mutates all the time.

Bleeding from wounds is particularly dangerous, and many burial practices are very “dodgy” to say the least.

For example, two burials in Sierra Leone infected a further 68 people.

A lot of work had gone into working with the community to educate them. Sadly hospital workers and burial workers are at greatest risk.

However the organism is very fragile, and will not survive long outside the human body. While its survival will depend on precise conditions, it will not live on hard surfaces.

Dealing with faeces is a very particular problem.

Corpses are buried in a double layer of tough polythene.

BRITAIN'S CONTRIBUTION

The NHS does not recruit from West Africa and we hope that our NHS staff will volunteer.

It is essential that recruits understand the culture as well as the

disease. Volunteers undergo two weeks training at Porton Down.

We can be proud of the contribution which the UK is making – probably more than the rest of the EU put together, although other countries are increasing their input significantly.

Britain has not only provided health care workers, but our military contribution has been huge. In addition to the provision of helicopters, our soldiers have been building hospitals and isolation units.



We have also led in the modelling of the disease progression and transmission.

Our Public Health Laboratory Service is unique in having two high category facilities to enable research to be undertaken.

In Liberia, it is the US which is the lead country.

One concern is social breakdown in UK communities. There have been suggestions of banning some children from school.

SCIENCE AND THE TRUTH

The CMO emphasised that the only way to deal with such incidents is to emphasise the scientific truths.

Three potential vaccines are well under way in development and testing.

However there is still a great shortage of hospital and isolation beds. We may need hospital ships.

The safety of medical workers also gets in the way. Médecins Sans Frontières will not allow intravenous rehydration, because of risk to workers.

There is a shocking lack of research into support care for patients. Rehydration is vital, and not enough work has been done on how to achieve this.

It is important to remember that other haemorrhagic fevers also need vaccines. The US is doing a lot of work in this area.

Previous outbreaks have been contained by public health measures.

Because they were mainly in rural areas, contact tracing was possible.

Now the disease is in urban areas, contact tracing is not usually possible.



Early diagnosis is essential, but such tests need to be sensitive and specific.

A false positive could be a death sentence.

We need to perform such tests quickly and transmit the results rapidly.

Because few have survived the disease, it is too early to know whether sufferers can contract the disease again.

The CMO confirmed that tackling antibiotic resistance should be regarded as one of our millennium goals.

DEFENCE

Defence against Ebola requires soap, water and chlorine. It would be a mistake to change a routine which is effective. Changes often give rise to new errors.

It was not necessary to provide immigration officers with protective clothing. The system deals with those who become ill on the plane. If the traveller is not showing symptoms then (s)he is not a hazard. Those returning are told to take their temperature twice a day, and report any untoward symptoms.

Similarly, our knowledge of ship movement and arrivals enables appropriate monitoring to be in place.

In November, 316 returning passengers were being followed up.



One major issue in affected countries was the effect of diminishing other aspects of health care. Vaccination programmes were being seriously affected. It could even give rise to other major epidemics as a result.

We (and the WHO) were undoubtedly too slow to respond in the early days of the outbreak. We will be quicker next time.

The Congo has revised its funeral practices.

Modelling has now been done to anticipate outbreaks in major centres of population.

All the speakers were thanked for giving such information and assurance in only 70 minutes.

ENERGY STORAGE

Meeting of the Parliamentary and Scientific Committee on Tuesday 18th November

ENERGY STORAGE: Technology and Policy Innovation



Dr Jonathan Radcliffe
Senior Research Fellow, University
of Birmingham

Energy systems are coming under pressure to be more flexible, with greater reliability and to meet changing or increasing demands, all within tight economic constraints and over short time periods. Energy storage is being viewed as one of the key enabling technologies that will allow the infrastructure to meet these challenges.¹ In the UK, as generation from variable renewables increases, and our use of energy changes, storage could allow a more efficient system to be developed. However, there are both technical and non-technical barriers to be overcome if new technologies are to play a major role.

THE CURRENT ROLE OF STORAGE

Energy storage is not a new concept: we have long had stocks of coal or reservoirs of natural gas serving power stations or homes, reducing exposure to variations in the supply chain and allowing responses to varying demand over daily and annual cycles. A pile of coal next to a power station can exceed one million tonnes, equivalent to about two months' electrical output.

'Rechargeable storage' gives the extra functionality of absorbing energy or power that is instantaneously available, and being able to return it at a later time (of course with an energy cost). Pumped hydro was built alongside the nuclear programme, as nuclear plant has limited ability to change its

output. When excess electricity is available at times of low demand, such as during the night, water is pumped from a lower to higher reservoir. Later, the energy is recovered by letting it flow back down the hill through turbines, meeting the peaks whilst the conventional plant runs efficiently at a constant output. For a few hours, the output from pumped storage can be equal to that of a power station; though around 20% of the initial energy will have been lost.

Hot water tanks provide essentially the same service, but

2030, and using that low carbon power for heating and transport needs, displacing fossil fuels, in subsequent decades.

We are now going through a period of rapidly increasing generation from renewables, especially wind. With cost reductions, solar PV is likely to far exceed previous predictions, and be placed on distribution networks, rather than under the control of the system operator, National Grid. Early in the 2020s, it could be common to have variable renewable capacity covering more than half of total demand.

... energy storage can reduce system costs ...

on a distributed basis and providing thermal, rather than electrical, energy. Nearly 50% of the UK's energy consumption goes on some form of heating.² With 14 million tanks installed in homes, the total stored energy is three times that from pumped hydro.

For decades, the demand for energy has been largely predictable, generation has been responsive and mechanisms have evolved (driven by varying combinations of engineering and politics) to ensure supplies have been available at the right times.

THE FUTURE ENERGY SYSTEM

To meet climate change mitigation targets, most scenarios for the UK favour reducing emissions from power generation to near zero by

At the same time, if heating is to be electrified, we need to recognise that with the changing weather, demand can quadruple between summer and winter; and by half over a period of a day or two. Transferring provision from natural gas to electricity generation capacity would mean adding ten or more large power stations with low utilisation rates.

These changes in supply and demand will have an impact on the power network and wider energy system across timescales of seconds (and less) to months.

ENERGY STORAGE AS A SOLUTION

'Energy storage' encompasses a broad family of technologies, covering chemical, electrochemical, thermal, mechanical and electrical forms

of energy.³ Each has characteristics for delivering its energy or power, over different timescales, with varying physical features of the devices themselves.

The most obvious services which will avoid the need to build generation plant that would otherwise meet peak demand at low utilisation rates are:

- Daily arbitrage: absorbing energy in periods of low demand or excess supply (when prices are low), and delivering back when demand increases or supply drops (when prices are high).
- Balancing: providing reserve power to balance supply and demand, or maintain the system frequency, over short timescales. National Grid forecasts their Short Term Operating Reserve capacity to increase from 3.5 to 6.5 GW in 2020, with market value increasing from £200m to nearly £1bn.

At a more local level, existing infrastructure could be maintained even if demand for electricity increases, by 'peak lopping'. This would push energy through constrained networks and store it until required by the user, reducing the size of the capacity required.

Many energy storage technologies are able to operate such that they can meet more than one of the challenges that will be experienced, but some are better-suited to certain applications. Technologies such as pumped hydro, liquid air, compressed air, flow batteries and hydrogen can increase the amount of energy held at relatively low cost, and is mostly dependent on availability of physical space. For more power-based technologies, such as flywheels, superconducting magnetic energy storage or supercapacitors, these discharge

rapidly.

Battery technologies sit in the middle – they can deliver high power and large quantities of energy. But increasing the amount of stored energy means having more batteries, and so is an expensive option for large applications. In some cases cost is less of a factor (including for the demonstration of energy storage operation in principle), and given their availability (from electric vehicle production) batteries are often chosen.

As well as energy storage, there are other ways of meeting the supply/demand challenges: installing more responsive generation supplies, increasing network capacity (including to other markets), and making demand more responsive. Any decision to deploy a technology must consider the alternatives. However, studies have shown that energy storage can reduce system costs, compared to the other options.⁴

Much analysis is now focused on assessing which technologies could fit different applications, give their costs and performance, and – critically – what value can be gained from their operation.

TECHNOLOGY INNOVATION

In 2012, energy storage was selected as one the Government's 'Eight Great Technologies'.⁵ Major investments have since flowed, including from the Research Councils, the Department of Energy and Climate Change (DECC) and the energy regulator, Ofgem. So whilst public funding for research, development and demonstration activities has increased in recent years, it is still at relatively low levels – funding for energy innovation overall in the UK is behind that of other countries, and low given the scale of the

challenge.⁶

On top of this, the different roles of each organisation can make it hard to focus on the objectives of support – whether it is for the benefit of industry, the energy system or science. Coordination to achieve common goals is essential, something the UK has struggled with in the past.⁷

Excellence in some of the underlying science and engineering behind energy storage technologies has meant the UK has several companies developing new technologies that could be exported into other markets.

POLICY INNOVATION

Whilst the benefits of energy storage are being recognised, and the technologies are emerging, being able to access the system value and build a business case for deployment is not yet viable. A report for Government has identified energy storage as having the highest occurrence of market and innovation system failures from across a number of technologies and business areas.⁸

In part this is due to the currently low value of the flexibility offered by energy storage, but which will become more significant as generation from variable renewables increases over the next ten years. Many technologies are too expensive and at pre-commercial stages of development; but the aim is for this to improve, with innovation support reducing costs and de-risking further investment.

At the same time, specific policy and regulatory issues affect how energy storage can operate. Providing multiple services, and gaining revenue from each market, is not always compatible with existing regulatory frameworks. Classified

as both a generation asset and consumer, energy storage can be subject to double jeopardy when it comes to a number of environmental levies – effectively being charged twice for 'green' tariffs. This is a rather perverse consequence, as the aim is to improve the efficiency of a system with more variable renewable generation.

The risk is that energy storage withers in the UK whilst other, more progressive, markets promote its early adoption. Without mechanisms to recognise the potential, generation from gas or coal is likely to crowd out the market in the short term, when energy storage may offer longer term cost, carbon and system benefits.

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ENERGY STORAGE AND THE 'COLD ECONOMY'

Professor Toby Peters



Toby Peters is Visiting Professor of Power and Cold Economy Birmingham Energy Institute, the Founder and Senior Group Managing Director of Dearman Engine Company, and the founder of Highview Power Storage.

Energy storage has long been recognised as vital to a decarbonised and secure electricity grid and low carbon transport. But conventional technologies – batteries, pumped storage, compressed air – all have their drawbacks. Now the idea of storing energy as cold and power – in the form of liquid air or nitrogen – is rapidly gaining support. This is not a panacea but would allow 'wrong time' energy and waste cold to be recycled into zero-emission peak power, cooling and even transport fuel. Liquid air technologies now being developed in Britain would help balance intermittent renewable generation, reduce emissions and cost, and could eventually form a joined-up 'Cold Economy'.

Cold is the Cinderella of the energy debate. Governments have developed policies governing most sectors – electricity, heat, transport – but the energy consumed for cooling gets much less attention. Yet cooling underpins many vital aspects of modern life: air conditioning; data centres; superconductors; medicine; industry; and the 'cold chain' of refrigerated warehouses and vehicles needed to preserve food from farm to fork. Cooling already consumes 15% of global electricity, and demand is soaring worldwide – nowhere more so than in emerging markets – causing higher emissions of greenhouse gases and air pollution. Global cooling demand in 2030 could equate to three times the current generating capacity of the UK.

The pollution from cooling is little recognised but poses a growing threat. One particular culprit is the transport refrigeration unit (TRU) – the secondary diesel engine that powers refrigeration on trucks worldwide. TRUs not only consume up to 20% of the

truck's fuel, but also emit up to 29 times as much particulate matter (PM) and up to six times as much nitrogen oxide (NO_x) as a modern propulsion engine. Such local air pollution causes 29,000 premature deaths in Britain each year; 400,000 in the EU; and 600,000 in India.

... the solution to the intermittency of renewable generators ...

Leaks of TRU refrigerant gases have a grossly disproportionate impact on greenhouse gas emissions; the most commonly used 'F-gas' is almost 4,000 times more potent than CO₂. The global fleet of refrigerated trucks is forecast to double to 9 million by 2025 – so we must find a way to 'do cold better'.

Even as cooling demand is soaring, vast amounts of cold are lost to the environment. The biggest source is the cold required to turn natural gas into compact Liquefied Natural Gas at -160C for transport by ship, which is simply discarded when the LNG is re-gasified at the import terminal. The projected global trade of LNG in 2030

would give off enough waste cold to provide cooling for over 4 million refrigerated trucks – more than the current global fleet. The trick is to find a means of storing, transporting and harnessing that cold, and one exciting new idea is liquid air.

Air turns to liquid when refrigerated to -196C, and can be conveniently stored in insulated but unpressurised vessels. Exposure to heat – including ambient – causes rapid re-gasification and a 710-fold expansion in volume, which can be used to drive a turbine or piston engine. Re-gasification also gives off lots of usable and valuable cold.

The key to exploiting liquid air is a novel piston engine invented by Peter Dearman, an archetypal British 'garden shed' inventor. Cryogenic expansion engines have existed for over a century, but the Dearman engine is innovative because the liquid air mixes with a 'heat

exchange fluid' (water and glycol) to promote rapid and efficient re-gasification inside the engine cylinder.

The Dearman Engine Company is developing the engine for a range of applications that will reduce cost and carbon emissions, and eliminate NOx and PM. The first is a highly efficient TRU, currently being tested on a vehicle by MIRA (formerly the Motor Industry Research Association), and is due to start fleet trials in 2015. Because diesel TRUs are so polluting, the impact of even a modest fleet of Dearman units could be huge. Modelling suggests 13,000 Dearman TRUs would reduce PM emissions by the same amount as taking 367,000 Euro VI trucks off the road – more than three times the entire UK articulated truck fleet – or more than 2 million modern diesel cars.

... Cooling already consumes 15% of global electricity ...

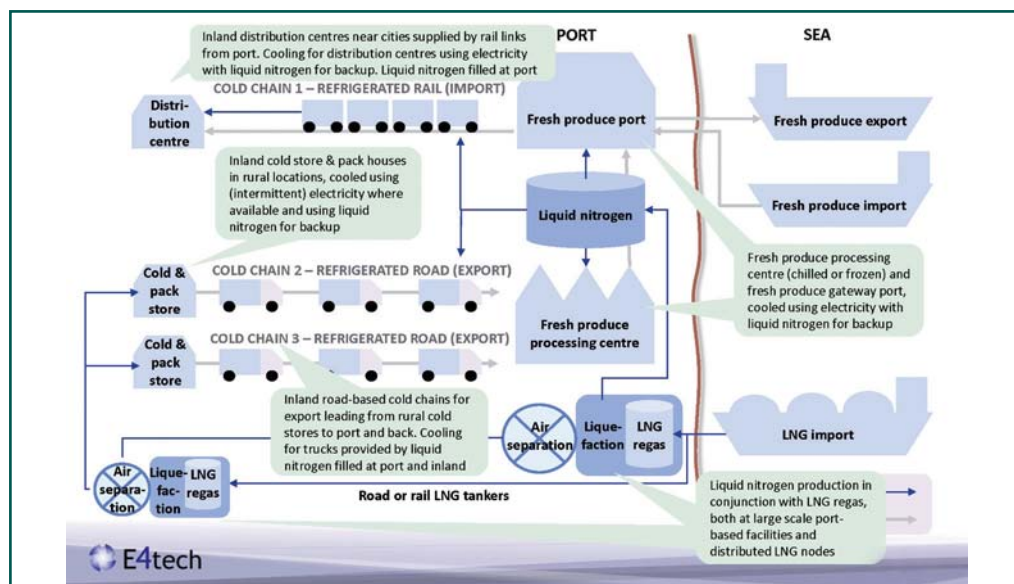
The next is a 'heat hybrid' combination of a Dearman engine with a diesel engine, in which waste heat and cold are exchanged to raise the efficiency of both, and reduce fuel consumption by 25%. A heat hybrid bus would cut carbon emissions by as much as an electric hybrid but at a fraction of the cost. A consortium led by Dearman has been awarded nearly £2 million by Innovate UK (formerly Technology Strategy Board) to build a heat hybrid prototype by 2016.

Dearman is also developing an electricity generator to displace the diesel 'gensets' that provide emergency power – often for cooling – to many hospitals, data centres and companies, and which also supply electricity to the grid to meet the highest

demand peaks. Diesel gensets are reliable and cheap, but like TRUs they also emit large amounts of carbon, NOx and PM. With Britain's grid capacity margin down to just 4%, such backup generation is more vital than ever to ensure security of supply. Yet as concern over urban air pollution grows, relying on diesel gensets will become increasingly untenable – they are already banned for grid support in the City of London. Providing reserve services in Britain with a Dearman liquid air zero-emission genset would reduce annual CO₂ emissions by 100-500 tonnes of CO₂ per

generators such as wind and solar: absorbing and storing 'wrong time' or surplus renewable energy to use on demand in grid or transport applications. Liquid nitrogen is delivered to industrial users daily by road tanker, so the distribution system already exists, and can be supplied at prices that make the technology competitive with diesel – liquid air would be even cheaper to produce. A liquid air TRU would cost broadly the same as a diesel system to build but £1,200 per year less to operate, as well as being zero emission.

emerging economies such as India and China, which suffer appalling levels of local air pollution, and post-harvest food losses of up to 50%. On current trends, India may produce barely 60% of its own food by 2030, but if developing countries had the same level of cold chain capacity as do developed countries, they could save 200 million tonnes each year that currently goes to waste. Both India and China are investing furiously to expand their insufficient cold chains and may have to add over a million refrigerated vehicles by 2025 to meet demand, so they badly



How waste cold from LNG re-gasification could power the 'Cold Economy' in India. Source: E4tech

MW installed, a saving of 35-54%, which would rise further as grid decarbonisation targets are met. It would also eliminate NOx and PM emissions – allowing it to operate unconstrained in urban areas – and provide 'free' cold for businesses with high cooling loads such as supermarkets and data centres.

Liquid air is not yet produced commercially, but liquid nitrogen, which can be used in the same way, is already widely produced for industrial purposes. Both are produced by electric-powered plants, so either could provide the solution to the intermittency of renewable

Liquid air or nitrogen production plants could be integrated with LNG import terminals to harness the waste cold given off during re-gasification. This approach reduces the electricity required to produce liquid air, and its carbon intensity, by two thirds. The LNG waste cold resource is vast: we estimate the cold given off by the Isle of Grain LNG terminal over the course of a year would be enough to fuel London's entire 7,600 strong bus fleet as liquid air 'heat hybrids' more than six times over.

Liquid air cold chains could be particularly effective in rapidly

need a zero-emission alternative to diesel TRUs. At the same time, their LNG import capacity is expanding rapidly, raising the possibility of producing cheap, lower carbon liquid air or nitrogen to fuel a more sustainable cold chain. India's projected LNG imports of 60 million tonnes in 2022 could in principle produce enough liquid air to fuel over half a million zero-emission Dearman TRUs. In December, Dearman visited India to present its technology and the Cold Economy to the country's National Center for Cold Chain Development and Automotive Research Association.

DEMENTIA

Meeting of the Parliamentary and Scientific Committee on Tuesday 9th December

THE CHALLENGE OF DEMENTIA



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Dementia affects about 800,000 people in the UK. When you include people around a person with dementia, that number can be multiplied by two, three or four. Almost everyone knows of someone with dementia.

Awareness of dementia is at its highest. The Prime Minister's challenge was launched in March 2012 which highlighted the need for improved diagnosis, more research and reducing stigma.

Just over half the estimated number of people with dementia receive a formal diagnosis and there is significant variation across the country (figure 1). NHS England has an ambition that two thirds of the estimated number of people with dementia receive a diagnosis and post diagnostic support.

Research funding has also increased

For people over the age of 50, dementia is the most feared illness, more than cancer or heart attacks. Figure 3 outlines some of the effects that dementia can have on people. "Dementia friends" (dementia friends.org.uk) is a nationwide initiative which is a social movement to raise awareness of dementia and reduce the stigma associated with it. The ambition is to have one million "dementia friends" by March 2015. This emphasises that there is more to a person than dementia, that dementia is not an inevitable part of ageing, and that people can live well after receiving a

diagnosis of dementia (Sir Terry Pratchett continued to write his very successful novels and was knighted while he had dementia). Look at the

Alzheimer Society website (alzheimers.org.uk), or the dementia friends website (dementia friends.org.uk).

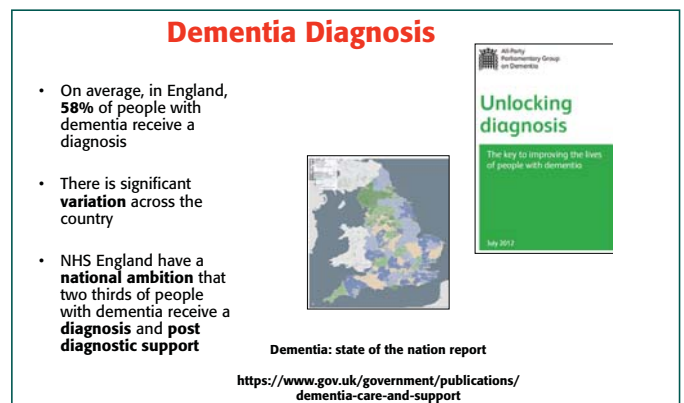


Figure 1



Figure 2



Figure 3

Three things are important in dementia: how do we diagnose it, how do we treat it and can we prevent it?

First, the diagnosis. Dementia is a way of simply describing a group of symptoms (of which people sometimes complain) and signs (which clinicians notice). The commonest cause of dementia is Alzheimer's disease (probably in just over half of people) followed by vascular dementia (where the blood supply to the brain is severely restricted which may also cause strokes). Other causes are less common such as Lewy body dementia (where there are some symptoms related to Parkinson's disease and a person may have persecutory ideas and episodes of confusion) and dementia of the frontal lobe type (where the front part of the brain is

... dementia is the most feared illness ...

selectively affected and the main symptoms are related to changes in personality and behaviour).

The initial symptoms of dementia vary depending on its cause. For example, symptoms of Alzheimer's disease usually start very gradually with loss of memory. It can sometimes be a challenge to decide whether these are symptoms of memory loss, which can occur with normal ageing or if it is the early signs of Alzheimer's disease.

Generally speaking, minor lapses of memory which occur from time-to-time and do not get worse very quickly are part of the normal process of ageing. Something which happens

much more regularly (most days), tends to get worse over a period of months, and is noticed by others, is less likely to be part of normal ageing. If a person is worried, they should seek advice from their own doctor in the first instance. People with vascular dementia tend to develop the symptoms much more suddenly and these may be more related

to inability to perform tasks of everyday living rather than just memory problems. People with Lewy body disease also tend to develop symptoms quickly and there can be episodes of confusion and symptoms of Parkinson's disease

When a person presents to their GP with symptoms, there are several things which need to

be investigated. Sometimes, depression in older people can give rise to symptoms similar to dementia (low mood, lack of enjoyment in things, loss of weight, early morning waking, crying and not looking forward to the future) and these symptoms need treating energetically. Also, there could

be a physical cause of the symptoms such as a low level of vitamin B12 or an underactive thyroid gland, diagnosed with a simple blood test and easily treated.

Second, what can be done to treat dementia? If there is

depression or physical illness present, this can usually be treated in a simple and straightforward way. There is no specific drug treatment for vascular dementia although the following will help, both in terms of reducing further memory impairment, but also in reducing the risk of heart attacks and strokes: controlling high blood

pressure and high cholesterol; treating any sugar diabetes; encouraging people to lose weight if necessary; to take more exercise and; to stop smoking. In terms of the

treatment for Alzheimer's disease, there are four drugs which are available – three are from the same class of agent (cholinesterase inhibitors which are drugs that stop the breakdown of acetylcholine in the brain therefore raising its level and improving symptoms).

The three drugs currently available are donepezil, galantamine and rivastigmine. The drugs are modestly effective when you examine a group of people with Alzheimer's disease

but, often, the response of individuals can be very pronounced. The improvement in symptoms is seen over weeks and months rather than hours or days. In some people, the symptoms improve, in others the drugs seem to slow

down the progression of the disease but in some they do not seem to have any effect. The fourth drug (memantine) acts on the glutamatergic receptors.

There are also non-drug approaches to symptoms and these tend to be very popular but the evidence base for them is not quite as strong as for medications. However, it is important to support people with dementia and their carers following diagnosis of dementia. There is good evidence that giving people support can improve the stress and strains of being a carer and also can improve the symptoms, and can prevent a crisis happening.

... what can be done to treat dementia? ...

Treatments like bright-light therapy, aromatherapy, cognitive stimulation therapy and reminiscence therapy all fall into the category of 'talking treatments' which can be helpful in alleviating symptoms.

Third, in terms of prevention of dementia there is much that can be done. There is evidence that reducing vascular risk factors like the ones mentioned above, can reduce the rate of strokes and heart attacks and reducing these medical conditions will reduce the rate of dementia. There is also evidence to suggest that it will reduce the rate of Alzheimer's disease as well as vascular dementia. In addition to the measures mentioned above, there is some evidence that, in general cardiovascular terms, drinking a moderate amount of alcohol is of benefit to you, but drinking to excess will cause a form of dementia.

DEMENTIA RESEARCH: Progress and Challenges



Dr Simon Ridley
Head of Research
Alzheimer's Research UK

WHY IS DEMENTIA RESEARCH NEEDED; WHAT MIGHT IT ACHIEVE

The impact of dementia upon individuals – those who are living with it as well as their families and dependents – can be devastating. The wider societal and economic impacts are also very significant (nearly £24 billion a year in the UK¹) and are likely to increase. The impacts of dementia will put even greater strains upon health and social care systems. Whilst remedial planning and action are needed here, and this will be neither simple nor cheap, research into the causes of dementia offers a solution to reducing these impacts.

*... depends on an accurate and
timely diagnosis ...*

Dementia presents a great unmet medical need. Current treatments are limited both by the degree and duration of their effectiveness, helping some with dementia with some of their symptoms for some of the time. Access to current treatments (or to any improved treatment of the future) depends on an accurate and timely diagnosis. Whilst progress is being made, the limitations of current diagnostic procedures present a clear need for research-led improvement.

Taking a public health perspective, the results of epidemiological studies and

other types of research are offering the prospect of risk reduction². Much evidence points towards risk reduction which approaches that for other chronic illnesses. While these approaches will not work for everyone, even a modest proportional reduction in risk at a population level could have a positive impact on a large number of individuals. This will benefit from a stronger evidence base.

WHAT CHALLENGES DOES DEMENTIA RESEARCH PRESENT?

From a scientific point of view, one of the greatest challenges is that dementia is a disorder of the brain, our most complex

organ and one which is inherently difficult to study and to treat. Dementia is not a single disease, or even a disease at all – it is a syndrome, a collection of symptoms which result from underlying and varied causes. The most common of these is Alzheimer's disease. Most dementias are associated strongly with increased age and so are complicated by other processes or conditions which can also accompany the ageing process. In Alzheimer's disease and in other dementias, there is a long and silent phase during which changes in the brain occur before the onset of any

symptoms. Researching the early events in the brain which lead to dementia is difficult since it is not clear who is undergoing these changes, and therefore whom to ask to volunteer.

Despite the unmet need, dementia research is seen as small, underfunded and unattractive. Previous work commissioned by Alzheimer's Research UK suggested that for every one researcher working in dementia, six work in cancer research³. This is true of academic research funded by government agencies and charities. Recent history within Pharma shows a very high failure rate of candidate treatments, and, given the complexity of development, the risk/reward ratio is often deemed too high, despite the huge potential rewards should a treatment be even moderately efficacious. Dementia research has been viewed as difficult and unattractive across all sectors.

WHAT HAVE WE LEARNED SO FAR ABOUT THE DISEASES WHICH CAUSE DEMENTIA?

Like many other chronic illnesses, a complex interplay of genetic and environmental risk factors are behind the development of dementia. Age remains the biggest single risk factor in most cases.

Alzheimer's and Parkinson's disease (which can often lead to dementia) as well as rarer

dementias such as Dementia with Lewy Bodies, Frontotemporal dementias and prion disease (CJD) are characterised by the damage to, and death of, nerve cells in the brain caused by an abnormal build up of specific proteins. This process is called neurodegeneration. The type of protein and the parts of the brain affected define the disease type and the symptoms.

... Dementia is not a single disease ...

The second most common dementia is vascular dementia, which results from damage to, and death of, brain cells following impaired blood supply. There is some overlap here with stroke but rather than a dramatic and sudden event, the damage seen in vascular dementia can be low-level, but cumulative. 'Mixed dementia' of more than one cause or type is not uncommon (eg Alzheimer's and vascular). This presents an additional challenge for any treatments. In dementia, as with a range of other chronic illnesses, there is increasing recognition of a role for the inflammation which may exacerbate disease process.

... inflammation which may exacerbate disease ...

These dementias are progressive and irreversible. It would be very attractive to think of a single 'cure-all' treatment which could protect nerve cells from dying in any dementia. However, the common underlying mechanisms are not well understood and most attention has been focused on the different upstream causes, particularly in Alzheimer's disease.

WHAT IS NEEDED TO ACHIEVE THE GOALS OF BIOMEDICAL DEMENTIA RESEARCH?

If we wait until we fully understand all the science behind dementia before trying to develop new treatments, we will be waiting too long. We should keep looking for new treatments based upon what we know already – and most of this knowledge is of Alzheimer's disease. However, there is an

urgent need to investigate new disease mechanisms and consequentially, to accelerate the identification of new drug targets. In parallel, we need to develop new ways of detecting and measuring different dementia pathologies in people who may not be showing overt symptoms or who are in the earliest stages. Whilst these may eventually have some clinical diagnostic or prognostic use, more immediate uses are in research – such as the identification and stratification of participants in clinical trials as well as tracking the efficacy of new treatments. Brain imaging is already making significant progress to these ends. Efforts

are taking place to find other 'biomarkers', for example in cerebrospinal fluid or even in blood. Neuropsychological tests may also offer more sensitivity and specificity in measuring subtle, early cognitive changes caused by dementia.

Beyond the purely scientific, there are other important considerations if we are to see

new treatments for dementia:

- The environment, support and infrastructures for challenging types of clinical trials with a vulnerable patient group
- Incentivising investment from Pharma/Biotech.

This could be through private/public partnerships in which early findings from academic research have a clear and facilitated path towards commercial drug discovery and development. Regulatory incentives may also be needed.

- Funding streams to attract and retain researchers in dementia research and to promote the translation and implementation of outputs.

Alzheimer's Research UK is committed to addressing many of these points⁴ but the scale of

... Brain imaging is already making significant progress ...

challenge demands a variety of responses and participants. In recent years there has been unprecedented interest and activity surrounding dementia and dementia research. In the UK, the Prime Minister's Challenge on dementia has brought additional research funding. The UK used its recent G8 presidency to raise the international profile of dementia research, culminating in a pledge to find a cure or 'disease-modifying' treatment by 2020. The G7 countries subsequently spearheaded three Global Action Against Dementia events focused on harnessing the momentum created by the UK presidency and galvanising activity across the globe. To sustain this legacy a World Dementia Envoy and World

Dementia Council have been appointed, with a remit to support co-operative work between G7 countries, and beyond, to incentivise investment in research.

Despite the large and many challenges, we must capitalise on these opportunities. The UK is well placed to play its part. We owe it to the 44m people worldwide who currently have dementia and to future generations.

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DEMENTIA: ECONOMIC CONSIDERATIONS



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Personal Social Services Research
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Dementia is costly. The costs (to the public purse as well as to individuals) will get considerably greater as the population ages. This has focused the minds of many governments on ways to contain those costs, whilst ensuring that people with dementia and their carers can live well. What needs to be done to achieve that important goal?

COSTS

The annual cost of dementia in the UK today exceeds £26 billion (Prince et al 2014). Costs to the NHS are substantial, equivalent to almost 4% of total health spend in the country, but costs to the social care sector are 2.5 times higher. More than half the social care cost falls directly to the people who use services (as self-funders or through user charges). But the largest cost is the time spent providing care and support by unpaid family members and other carers.

Some of these costs are welcome, others not. The 'good costs' represent the appropriate, evidence-based treatment and care responses to assessed

people with dementia in the UK today, and that number will double in 25 years. Even though the age-specific prevalence rate might be slowing (Matthews et al 2013), the total number with dementia will still grow rapidly as the population ages. Consequently, unless we can do something to change those trajectories, there will need to be even greater reliance on unpaid carers and big increases in health and social care service costs.

RESPONDING TO THE CHALLENGE

The figures summarised above are just aggregates. They are not cost-effectiveness findings. They do not tell key decision-makers what they might do to improve

attainment. Norton et al (2014) estimate that 'around a third of Alzheimer's Disease cases worldwide might be attributable to potentially modifiable risk factors'.

Another strategy would involve more timely identification of dementia and better screening (ie faster responses to early signs of dementia, and better screening tools to improve diagnostic accuracy). This would undoubtedly help individuals to plan their lives and should also enable them to get better health and social care support, although access remains variable across the country. Timely diagnosis might therefore also head off some crisis-related costs.

Post-diagnostic support is where most of the costs of dementia arise: this support encompasses all community and other health and social care services that people with the condition might use, plus unpaid support from carers. It also includes costs of care home residence and hospital inpatient admissions. Those latter costs can be huge, but the benefits for quality of life and health can also be substantial.

We now have a small body of robust evidence on what works in post-diagnostic support. Research has focused on areas such as carer support, staff skills, symptomatic medications, psychosocial treatments, better home-based care (including

... we surely want to shift the balance ...

needs. The 'bad costs' result from late or no diagnosis, unavailability of effective care, crisis admissions to hospital and unnecessarily long inpatient stays. It is hard to calculate the relative sizes of the 'good' and 'bad' costs, but as a society we surely want to shift the balance from the latter to the former, by developing, and making more widely available, good quality (evidence-based) treatment and care arrangements.

The need to shift the cost balance is obvious if we look at future projections of dementia prevalence. There are 816,000

the situation for individuals affected by dementia, or how to make better use of resources.

There are several options for reducing future costs and improving lives. One is risk-reduction: reducing the number of people who develop dementia, or delaying the age at which the condition interferes significantly with their lives. Known risk factors for the development of Alzheimer's disease and other dementias include diabetes, mid-life hypertension, mid-life obesity, physical inactivity, depression, smoking and low educational

growing interest in, but not much evidence on assistive and information technologies) and care co-ordination. We also now have a body of *economic* evidence, helping us to recognise what resource consequences might flow from those interventions (Knapp et al 2013).

SUPPORTING FAMILY CARERS

An example of new evidence that can provide guidance to

or positive) on people with dementia (illness severity, neuropsychiatric symptoms or quality of life). And START was clearly cost-effective. Although service costs went up over time for people in both the intervention and control groups - which is not surprising given how dementia usually progresses - overall, the START intervention was no more costly than standard support arrangements.

... more timely identification of dementia ...

commissioners and other decision-makers comes from a study of START: an intervention to help family carers of people with dementia to develop better coping strategies. It was delivered by psychology graduates, with each carer having eight one-to-one sessions. Carers were given information on where to get emotional support, and taught (personalised) techniques to improve their understanding and manage the behaviours of the person they cared for, change unhelpful thoughts, promote acceptance, improve communication, plan for the future, relax and engage in meaningful enjoyable activities.

... head off some crisis-related costs ...

START was evaluated over 24 months in a randomised controlled trial in North London and Essex. Results were very positive. Carers who received START had significantly better health-related quality of life and better mental health by the 24-month follow-up point than carers who got usual support. There were no effects (negative

NEW SCENARIOS

My colleagues and I recently examined the economic consequences of different scenarios for future dementia care (Knapp et al 2014). Some scenarios looked at the wider availability and use of evidence-based interventions, while others looked at the consequences of introducing a disease-modifying treatment (as yet undiscovered) with the potential either to slow disease progression or to delay its onset.

When we looked at the wider availability of interventions such as anticholinesterase inhibitors, cognitive stimulation therapy, case management and carer support, we found that the

bring down the total cost 'bill' of dementia by any noticeable amount.

On the other hand, a disease-modifying treatment - or, indeed, a risk-reduction strategy - that delayed onset by a year or longer would bring down costs substantially. Slowing the progression of the disease would also potentially reduce costs, because it would delay the need for people to go into care homes or hospital. There would also be gains in health and quality of life for the individuals at risk of developing dementia and their families.

However, disease-modifying treatments do not yet exist, and it is difficult to conjecture when they might become available. It is also difficult to know what they might cost per patient. A high price for a new disease-modifying medication, for example, would considerably reduce (indeed perhaps

over a 25-year period, exploring a wider range of potential interventions (including risk-reduction), and carrying out more exacting analyses.

This is the MODEM study. It is funded by the Economic and Social Research Council and the National Institute for Health Research. It will start to generate findings in the next couple of years, and provide a platform of evidence to inform decisions about how the country can develop affordable, effective and cost-effective systems of care and support.

POLICY RESPONSES

In England we have been fortunate over recent years to have had two well-structured policy frameworks: the National Dementia Strategy (Department of Health 2009) and the Prime Minister's Challenge on Dementia (Department of Health 2012). A new dementia

... understand the aetiology of the various dementias ...

completely wipe out) the savings on care costs that would be suggested by slowed progression or delayed onset.

MODEM

With colleagues at LSE and other universities, I have recently started a study which will be projecting numbers of people with dementia from now to 2040, the costs of supporting them and the quality of life outcomes under present care, support and treatment arrangements. We will then explore what would happen in cost and outcome terms if better interventions were more widely available. We will run through the scenario exercise described, but now projecting

policy ('Vision') is currently being discussed for England, offering suggestions for how society can best respond to dementia over the coming years.

In parallel, on the international stage, the G8 countries - along with the OECD and WHO - have committed to collaborative action to address the dementia challenge. This includes setting up the World Dementia Council. The Council (of which I am a member) is looking for ways to improve finance for investments in new treatments, better care, research collaboration (across governments, academics and industry), harmonised regulatory pathways to accelerate drug development, sharing data,

identification and dissemination of best practice, and awareness-raising with respect to the economic and social challenges of dementia.

A THREE-PRONGED FUTURE

I have mostly concentrated on economic issues, although set in their wider context. We know that dementia is a major, world-

necessarily include the (often hidden) burden falling on unpaid family and other carers.

Efforts to understand the aetiology of the various dementias need as much support as we can muster, as do efforts to find biomarkers and treatments. We urgently need to understand what risk-reduction strategies might be effective,

... START intervention was no more costly ...

wide challenge for health and care systems, and for societies more generally. Unless someone suddenly discovers an affordable cure, those challenges will get considerably bigger over the next 40 years. The costs of dementia will also increase considerably. That will

and how best to implement them. We also need to know what care and support arrangements work best. Then we need to assess whether they represent cost-effective uses of society's always scarce resources.

The policy imperatives are clear, if slightly daunting. If the overarching objectives are to achieve better health and quality of life for people with dementia – indeed for everyone – and to make the best use of resources, then we need a three-pronged strategy to reduce risk, improve care and find a cure.

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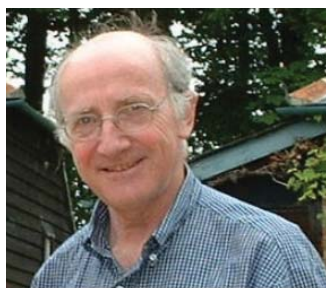
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HOUSE OF LORDS SCIENCE AND TECHNOLOGY SELECT COMMITTEE



The members of the Committee (appointed 12 June 2014) are Lord Dixon-Smith, Baroness Hilton of Eggardon, Lord Hennessy of Nympsfield, Lord O'Neill of Clackmannan, Baroness Manningham-Buller, Lord Patel, Lord Peston, Lord Rees of Ludlow, Viscount Ridley, the Earl of Selborne (Chairman), Baroness Sharp of Guildford, Lord Wade of Chilton, Lord Willis of Knaresborough and Lord Winston.

Resilience of Electricity Infrastructure

In July 2014, the Committee launched an inquiry into the resilience of electricity infrastructure. The inquiry is focusing on the resilience of the UK's electricity infrastructure to peaks in demand and sudden shocks. It is interested both in the short term (to 2020) and in the medium term (to 2030) as electricity generation is decarbonised. Oral evidence was taken until late January 2015 and the Committee will report by the end of the Session.

2025: Priorities for Scientific Research

In July 2014, the Committee conducted a short inquiry looking at the key challenges that the Government's forthcoming *Science and Innovation Strategy* should tackle and the UK's

main priorities for scientific research. No report was produced but evidence was taken in public and transcripts were published and brought to the Government's attention.

Behaviour Change

In May and June 2014, the Committee took oral evidence from a small number of witnesses to follow up on its 2011 report into behaviour change and assess what progress has been made in this area. This focused on the two behaviour change case studies that the Committee had investigated in its original inquiry: modal shift in transport and obesity. The Committee wrote to the Minister for Government Policy, Rt Hon Oliver Letwin MP, in July, making a number of observations and posing a series of questions, and received a reply.

International STEM students

In January 2014, the Committee launched a short follow up inquiry to its 2012 report on higher education in science, technology, engineering and mathematics (STEM) subjects. The inquiry focused on the effect on international STEM students of immigration policy. Forty or so written submissions were received, seven oral evidence sessions were held in February and March, and a report published on 11 April 2014. A Government response was received in July. A debate is pending.

Waste and the bioeconomy

The Committee launched an inquiry into waste and the bioeconomy in July 2013. The inquiry collected evidence on the technology used to exploit bio-waste and waste gases in order to generate high-value products. The inquiry aimed to assess the potential for this technology to enable bio-waste and waste gas to

replace current feedstocks, and the potential contribution this could make to a bioeconomy. Oral evidence sessions were held across autumn 2013 and early 2014. The Committee published its report on 6 March 2014. A Government response was received in June and a debate held in Grand Committee on 10 December.

FURTHER INFORMATION

The reports, Government responses, written and oral evidence to the Committee's inquiries mentioned above, as well as the Calls for Evidence and other documents can be found on the Committee's website. Further information about the work of the Committee can be obtained from Chris Clarke, Committee Clerk, clarkechr@parliament.uk or 020 7219 4963. The Committee Office email address is hlsceince@parliament.uk.



HOUSE OF COMMONS SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY



The Science and Technology Committee is charged with the scrutiny of the expenditure, administration and policy of the Government Office for Science, a semi-autonomous organisation based within the Department for Business, Innovation and Skills.

The members of the Science and Technology Committee are:

Dan Byles (Conservative, North Warwickshire), Jim Dowd (Labour, Lewisham West and Penge), David Heath (Liberal Democrat, Somerton and Frome), Stephen Metcalfe (Conservative, South Basildon and East Thurrock), Andrew Miller (Labour, Ellesmere Port and Neston), Stephen Mosley (Conservative, City of Chester), Pamela Nash (Labour, Airdrie and Shotts), Sarah Newton (Conservative, Truro and Falmouth), Graham Stringer (Labour, Blackley and Broughton) and David Tredinnick (Bosworth).

Andrew Miller was elected by the House of Commons to be the Chair of the Committee on 9 June 2010. The remaining Members were appointed to the Committee on 12 July 2010. Caroline Dinenage, Gareth Johnson, Sarah Newton and Hywel Williams were appointed to the Committee on 27 February 2012 in the place of Gavin Barwell, Gregg McClymont, Stephen McPartland and David Morris. Jim Dowd was appointed to the Committee on 11 June 2012 in the place of Jonathan Reynolds. David Morris was re-appointed to the Committee on 3 December 2012 in the place of Gareth Johnson. David Tredinnick was appointed to the Committee on 4 February in place of Caroline Dinenage. David Heath was appointed to the Committee on 25 November 2013 in place of Roger Williams. Hywel Williams was discharged from the Committee on 20 October 2014. David Morris was discharged from the Committee on 24 November 2014. Dan Byles was appointed to the Committee in place of David Morris on 1 December 2014.

CURRENT INQUIRIES

All evidence (written and oral) is on the Committee's website.

Antimicrobial resistance

On 18 December 2013 the Committee took evidence from Dr Pat Goodwin, Society of Biology, Professor Laura Piddock, British Society for Antimicrobial Chemotherapy, Professor John Threlfall, Society for Applied Microbiology, and Professor Sharon Peacock, Cambridge Infectious Diseases Initiative, University of Cambridge.

On 8 January 2014 the Committee took evidence from Professor Anthony Kessel, Public

Health England, Dr Michael Moore, Royal College of General Practitioners, Professor Alison Holmes, Imperial College London and Dr Susan Hopkins, Royal College of Physicians; John Hardcastle, Novolytics, Dr David McIntosh, Novartis, Professor George Lewith, University of Southampton Medical School and Doris-Ann Williams, British In Vitro Diagnostics Association.

On 29 January 2014 the Committee took evidence from Phil Sketchley, National Office of Animal Health, John FitzGerald, Responsible Use of Medicines in Agriculture Alliance, Catherine McLaughlin, National Farmers' Union and Cólín Nunan, Alliance to Save our Antibiotics.

On 26 February 2014 the Committee took evidence from Professor Jeremy Farrar, Wellcome Trust, Professor Sir John Savill, Research Councils UK, Kush Naker, Universities Allied for Essential Medicines UK and Professor Sir Anthony Coates, Antibiotic Discovery UK; Dr Louise Leong, Association of the British Pharmaceutical Industry, James Anderson, GlaxoSmithKline, Dr David Williams, Discuva and Michael McIntyre, European Herbal and Traditional Medicine Practitioners Association.

On 12 March 2014 the Committee took evidence from Professor Dame Sally Davies, Chief Medical Officer, Sally Wellsted, Department of Health, and Nigel Gibbens, Chief Veterinary Officer; George Eustice MP, Department for Environment, Food and Rural Affairs, Jane Ellison MP, Department of Health, Professor Dame Sally Davies, Chief Medical Officer and Professor Peter Borriello, Veterinary Medicines Directorate.

A report was published on 7 July 2014. The Research Councils response was published on 21 October 2014 and the Government published its response as a Command Paper (Cm 8919).

Blood, tissue and organ screening

On 5 February the Committee took evidence from Mark Ward and Joseph Peaty, TaintedBlood, Liz Carroll, Haemophilia Society, Dr Matthew Buckland, UK Primary Immunodeficiency Network and Christine Lord; Professor Marc Turner, Advisory Committee on the Safety of Blood, Tissues and Organs Prion Group, Dr Roland Salmon, Advisory Committee on Dangerous Pathogens and Dr Sheila MacLennan, UK Blood Services Joint Professional Advisory Committee.

On 5 March 2014 the Committee took evidence from Dr Steven Burton, ProMetic Biosciences Ltd, Dr Kelly Board, DuPont Chemicals and Fluoroproducts, Dr Alex Raeber, Prionics AG, Nigel Talboys, Terumo BCT and Professor John Collinge, MRC Prion Unit.

On 26 March 2014 the Committee took evidence from Professor Richard Knight, National CJD Research and Surveillance Unit, Professor Sheila Bird, Medical Research Council Biostatistics Unit, Dr Paula Bolton-Maggs, Serious Hazards of Transfusion (SHOT) Haemovigilance Scheme and Dr Simon Mead, Association of British Neurologists.

On 28 April 2014 the Committee took evidence from Dr Richard Baker, British Transplantation Society, Dr Mike Knapton, British Heart Foundation, Ed Owen, Cystic Fibrosis Trust and Keith Rigg, Transplant 2013.

On 30 April 2014 the Committee took evidence from Professor James Neuberger, NHS Blood and Transplant, Dr Lorna Williamson, NHS Blood and Transplant, Dr Paul Cosford, Public Health England, and Dr Katy Sinka, Public Health England; Jane Ellison MP, Parliamentary Under-Secretary of State for Public Health and Professor Dame Sally Davies, Chief Medical Officer, Department of Health.

A report was published on 24 July 2014. The Government published its response in a Command Paper (Cm 8940).

National health-screening programmes

On 7 May 2014 the Committee took evidence from Professor Jane Wardle, Academy of Medical Sciences, Jessica Kirby, Cancer Research UK and Dr Sian Taylor-Phillips, Warwick Medical School.

On 11 June 2014 the Committee took evidence from Robert Meadowcroft, Muscular Dystrophy Campaign, Professor Michael Baum, Advocates for Honesty and Transparency in Breast Screening and Steve Hannigan, Children living with inherited metabolic diseases (Climb); Sile Lane, Sense About Science, Dr Margaret McCartney and Dr John Middleton, UK Faculty of Public Health.

On 25 June 2014 the Committee took evidence from Dr Hilary Burton, PHG Foundation, Professor Ian Cree, Warwick Medical School representing the Early Cancer Detection Consortium, Professor Ian Jacobs, PROMISE 2016, Owen Sharp, Prostate Cancer UK; Dr Kevin Dunbar, National Chlamydia Screening Programme, Dr Sharon Hillier, Public Health Wales, Dr Anne Mackie, UK National Screening Committee, Jamie Waterall, Public Health England.

On 9 July 2014 the Committee took evidence from Jane Ellison MP, Parliamentary Under Secretary of State for Public Health, Department of Health and Professor David Walker, Deputy Chief Medical Officer for England.

A report was published on 29 October 2014. The Committee is awaiting a response from the Government.

Practical science in schools

The Committee held two evidence sessions to discuss the proposals from Ofqual to change the practical assessment of science at A level.

On 12 May 2014 the Committee took evidence from Professor Julia Buckingham, SCORE, Dr Sarah Main, Campaign for Science and Engineering, Professor Ian Haines, UK Deans of Science and Malcolm Trobe, Association of School and College Leaders; Dennis Opposs, Ofqual, Glenys Stacey, Ofqual and Janet Holloway, Ofqual; and Elizabeth Truss MP, Parliamentary Under-Secretary of State for Education and Childcare.

On 3 September 2014 the Committee took evidence from Janet Holloway, Ofqual, Dr Steven Evans, OCR, Darren Northcott, National Association of Schoolmasters and Union of Women Teachers, Professor Iain Haines, Deans of Science, Nicole Morgan, Royal Society of Chemistry on behalf of SCORE, Steve Jones, CLEAPPS; Michelle Meadows, Ofqual, Stella Paes, AQA, Max Hyde, National Union of Teachers, Elizabeth Swinbank, York University, Ginny Page, the Gatsby Charitable Foundation, Peter Mayhew-Smith, Association of Colleges, Richard Needham, Association for Science Education; Dennis Opposs, Ofqual, Kaisra Khan, Voice, Professor Peter Main, Institute of Physics, Hilary Leever, Wellcome Trust, David Britz Colwill, Sixth Form Colleges Association, Helen Thorne, UCAS; Glenys Stacey, Chief Regulator, Ofqual, Liane Adams, WJEC Eduqas, Philip Britton, Headmasters and Headmistresses Conference, Rachel Lambert-Forsyth, Society of Biology, Sir John Holman, CST, Jill Stokoe, Association of Teachers and Lecturers, Sarah Main, CaSE.

The Committee published a video letter to the Minister on 2 December 2014 and received a response on 18 December.

Social media data and real-time analytics

On 18 June the Committee took evidence from Sureyya Cansoy, techUK, James Petter, EMC, Carl Miller, Centre for the Analysis of Social Media, Demos, Euan Adie, Altmetric.com, Digital Science; Professor John Preston, University of East London, Professor Mick Yates, University of Leeds, Dr Ella McPherson, University of Cambridge.

On 23 June the Committee took evidence from Professor Derek McAuley, University of Nottingham, Professor David De Roure, ESRC, Professor Sir Nigel Shadbolt, Web Science Trust and the Engineering and Physical Sciences Research Council project SOCIAM; Professor Liesbet van Zoonen, Loughborough University, Professor David Robertson, University of Edinburgh representing the UK Computing Research Committee, Dr Mathieu d'Aquin, Open University, Emma Carr, Big Brother Watch.

On 2 July the Committee took evidence from Steve Wood, Information Commissioner's Office, Dr Mark Elliot, University of Manchester, Dr Kevin Macnish, University of Leeds; Ed Vaizey, Parliamentary Under Secretary of State for Culture, Communications and Creative Industries, Department for Culture, Media and Sport.

A report was published on 28 November 2014. The Committee is waiting for a Government response.

Current and future uses of biometric data and technologies

On 1 December 2014 the Committee took evidence from Professor Juliet Lodge, Emeritus Professor of European Studies, University of Leeds, and member of the Privacy and Policy Expert Group at the Biometrics Institute, Professor Louise Amoore, Professor of Political Geography, Durham University, and Professor Sue Black, Director, Centre for Anatomy and Human Identification, University of Dundee; Sir John Adye, Chairman, Identity Assurance Systems, Ben Fairhead, Biometric Systems Engineer, 3M, and Erik Bowman, Systems Engineer, Northrop Grumman; Andrew Tyrer, Head of Enabling Technology, Innovate UK, Emma Carr, Director, Big Brother Watch, and Dr Peter Waggett, Chairman, British Standards Institution technical committee IST/44.

On 10 December 2014 the Committee took evidence from Dr Simon Rice, Group Manager (Technology), Information Commissioner's Office, Alastair R MacGregor QC, Biometrics Commissioner, Office of the Biometrics Commissioner, and Chief Constable Chris Sims, National Policing Lead for Forensic Science, Association of Chief Police Officers; Lord Bates, Parliamentary Under-Secretary of State for Criminal Information, Home Office.

A report is currently being drafted.

Genetically modified foods and application of the precautionary principle in Europe

On 15 October 2014 the Committee took evidence from Professor Ottoline Leyser, Fellow, The Royal Society, Professor Sir David Baulcombe, Regius Professor of Botany, University of Cambridge, Dr Doug Parr, Chief Scientist and Policy Director, Greenpeace UK, and Liz O'Neill, Director, GM Freeze.

On 29 October 2014 the Committee took evidence from Sile Lane, Director of Campaigns, Sense About Science, Dr Jack Stilgoe, Lecturer in Social Studies of Science, University College London, and Professor Brian Wynne, Professor of Science Studies, Lancaster University; Sue Davies, Chief Policy Adviser, Which?, and Jon Woolven, Strategy and Innovation Director, Institute of Grocery Distribution; Dr Helen Ferrier, Chief Science and Regulatory Affairs Adviser, National Farmers' Union, Peter Melchett, Policy Director, The Soil Association, and Professor Ian Crute, Non-Executive Director, Agriculture and Horticulture Development Board.

On 5 November 2014 the Committee took evidence from Professor Helen Sang, Fellow, Society of Biology, Professor Michael Bevan, Programme Leader, Cell and Developmental Biology, John Innes Centre, and Dr Paul Burrows, Executive Director, Corporate Policy and Strategy, Biotechnology and Biological Sciences Research Council; Dr Mike Bushell, Principal Scientific Adviser, Syngenta, Dr Julian Little, Chair, Agricultural Biotechnology Council, and Dr Geoff Mackey, Sustainable Development and Communications Director, BASF Europe North.

On 19 November 2014 the Committee took evidence from Professor Paul Nightingale, Deputy Director, Science Policy Research Unit, University of Sussex, Professor Andy Stirling, Co-director, STEPS Centre, University of Sussex, Professor Joyce Tait, Director, Innogen Institute, University of Edinburgh, and Sir Roland Jackson, Member, Nuffield Council on Bioethics; Professor Sir Mark Walport, Chief Scientific Adviser to HM Government and Head of the Government Office for Science.

On 1 December 2014 the Committee took evidence from Dr Elisabeth Waigmann, Head of GMO Unit, European Food Safety Authority, and Professor Joe Perry, Chair, GMO Panel, European Food Safety Authority; Eric Poudalet, Director, Safety of the Food Chain, Directorate General for Health and Consumers, European Commission, Dorothée André, Head of Unit, Biotechnology, Directorate General for Health and Consumers, European Commission.

On 7 January 2015 the Committee took evidence from Professor Rosie Hails, Chair, Advisory Committee on Releases to the Environment, Professor Peter Gregory, Chair, Advisory Committee on Novel Foods and Processes, and Professor Guy Poppy, Chief Scientific Adviser, Food Standards Agency; Lord de Mauley, Parliamentary Under-Secretary of State for Natural Environment and Science, Department for Environment, Food and Rural Affairs, and George Freeman MP, Parliamentary Under-Secretary of State for Life Sciences, Department for Health and the Department for Business, Innovation and Skills.

A report is currently being drafted.

Mitochondrial donation

On 22 October 2014 the Committee took evidence from Professor Doug Turnbull, Director, Wellcome Trust Centre for Mitochondrial Research, Professor Peter Braude, King's College London, Professor Robin Lovell Badge, MRC National Institute for Medical Research, Dr Edward Morrow, Senior Research Fellow, University of Sussex; Peter Thompson, Chief Executive, Human Fertilisation and Embryology Authority, Robert Meadowcroft, Chief Executive, Muscular Dystrophy Campaign, Professor Jonathan

Montgomery, Chair, Nuffield Council on Bioethics, and Professor of Health Care Law, University College London; Jane Ellison MP, Parliamentary Under-Secretary of State for Public Health, Department of Health, and Professor Dame Sally Davies, Chief Medical Officer, Department of Health.

The Committee's Legacy

On 3 December 2014 the Committee took evidence from Jane Ellison MP, Parliamentary Under-Secretary of State for Public Health, Department of Health, George Freeman MP, Parliamentary Under-Secretary of State for Life Sciences, Department of Health, and Professor David Walker, Deputy Chief Medical Officer for England, Department of Health; Mr Nick Gibb MP, Minister of State for School Reform, Department for Education.

On 14 January 2015 the Committee took evidence from George Eustice MP, Parliamentary Under-Secretary of State for Farming, Food and Marine Environment, Department for Environment, Food and Rural Affairs, Terence Illott, Deputy Director, Marine Environment Strategy, Department for Environment, Food and Rural Affairs and Paul Green, Operations Director, Veterinary Medicines Directorate; Lord Bates, Parliamentary Under-Secretary of State for Criminal Information, Home Office and Alan Pratt, Director of Science, Engineering and Technology, Home Office.

Funding of Kew Gardens

On 17 December 2014 the Committee took evidence from Professor Mary Gibby, UK Plant Sciences Federation, Professor Georgina Mace, Fellow, The Royal Society, and Sir Neil Chalmers, Chair of a 2010 independent review of Kew Gardens, commissioned by DEFRA; Richard Deverell, Director, Royal Botanic Gardens, Kew, Professor Kathy Willis, Director of Science, Royal Botanic Gardens, Kew, Julie Flanagan, Full-time officer, Prospect, and Ken Bailey, Trade union side lead for PCS, Prospect and GMB; and Lord de Mauley, Parliamentary Under-Secretary for natural environment and science, Department for Environment, Food and Rural Affairs.

REPORTS

National health screening

On 29 October 2014, the Committee published its Third Report of Session 2014-15, *National Health Screening*, HC 244.

Responsible use of data

On 28 November 2014, the Committee published its Fourth Report of Session 2014-15, *Responsible Use of Data*, HC 245.

GOVERNMENT RESPONSES

On 21 October 2014 the Committee published the Government Response to the Committee's report on Ensuring access to working antimicrobials, HC509.

FURTHER INFORMATION

Further information about the Science and Technology Committee or its current inquiries can be obtained from the Clerk of the Committee, Stephen McGinness, or from the Senior Committee Assistant, Darren Hackett, on 020 7219 2792/2793 respectively; or by writing to: The Clerk of the Committee, Science and Technology Committee, House of Commons, 7 Millbank, London SW1P 3JA. Enquiries can also be e-mailed to scitechcom@parliament.uk. Anyone wishing to be included on the Committee's mailing list should contact the staff of the Committee. Anyone wishing to submit evidence to the Committee is recommended to obtain a copy of the guidance note at www.parliament.uk/commons/selcom/witguide.htm. The Committee has a website, www.parliament.uk/science, where all recent publications, terms of reference for all inquiries and press notices are available.



PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY (POST)



RECENT POST PUBLICATIONS

Diffuse Pollution of Water by Agriculture

October 2014

POSTnote 478

Water pollution regulation is devolved in the UK. Surface, coastal and ground waters in England suffer from significant pollution problems: 78% of surface and groundwater bodies fail to meet the 'good' ecological status prescribed by the

EU Water Frameworks Directive. Pollution increases water treatment costs and adversely affects wildlife. Compared to treatment, preventing water pollution at source can have a cost-benefit ratio as high as 1:65. This describes the contribution of agriculture to water pollution, and measures that can be taken to reduce it.

Civilian Drones

October 2014

POSTnote 479

Civilian use of unmanned aircraft (UA) is increasing rapidly as the technology improves and becomes more affordable. The UK has technical expertise in this area and is also at the forefront of national and international regulatory discussions. This briefing provides an overview of current and future applications, and opportunities and barriers for civilian use.

Short Lived Climate Pollutants

October 2014

POSTnote 480

Short lived Climate Pollutants (SLCPs) include black carbon, methane, hydrofluorocarbons (HFCs) and ground level ozone. Although they have a shorter residence time in the atmosphere than CO₂, from a few days to a few decades, they contribute to near term climate change. This POSTnote summarises options for mitigating SLCP concentrations and the benefits and challenges of doing so.

Palliative and End of Life Care

October 2014

POSTnote 481

Palliative and end of life care refer to the care of people who have an incurable and progressive illness. This provides an overview of palliative care and its key components, approaches to managing and standardising care and key challenges to providing high quality care.

GM Crops and Regulation

October 2014

POSTnote 482

Genetically modified (GM) crops have been grown commercially since the mid-1990s. Early concerns focused on their potential impacts on human health and the environment. This note summarises the evidence for such impacts, describes recent technological developments and examines their likely consequences for proposed reforms of GM regulation.

GM Insects and Disease Control

November 2014

POSTnote 483

Insects play a critical role in ecosystems, but can also cause economic and social harm by transmitting diseases to humans and livestock, and damaging crops. Genetically modified (GM) insects could be used alongside other approaches to mitigate harms. This POSTnote summarises possible benefits, risks and uncertainties associated with their deployment.

Catchment-Wide Flood Management

December 2014

POSTnote 484

Changing weather patterns have made structural defences less effective at managing flooding. An approach that employs a range of natural flood management measures across a river catchment is likely to reduce the probability of flooding and pressure on structural defences. This POSTnote describes the measures and the challenges of implementing them over large catchments.

Parity of Esteem for Mental Health

January 2015

POSTnote 485

Achieving parity of esteem between mental and physical health in care standards and public attitudes has been attempted for decades. This note outlines the history of these efforts, the ways in which parity is defined and measured, the challenges of achieving this ideal, and the strategies that may be employed to that end.

Emissions from Crops

January 2014

POSTnote 486

Agriculture contributes 9% of the UK's greenhouse-gas (GHG) emissions burden and 10-12% globally. Although there is a long-term declining trend from UK agriculture the sector may still account for a larger share of overall emissions in future as other sectors reduce emissions. This POSTnote focuses on reducing GHG emissions from growing and storing arable and horticultural crops.

CURRENT WORK

Biological Sciences – Sugar, Minimum Age of Criminal Responsibility, Disorders of Consciousness, Anti-Ebola Treatments, Regulating Synthetic Biology.

Environment and Energy – Biodiversity Auditing, Energy Storage, Novel Food Production Technologies, Herbicide Resistance, Soils, Ecosystem Services & Food Security, Managing the UK Plutonium Stockpile, Offshore Mining.

Physical sciences and IT – Broadband Internet Access, The Darknet, Commercial Space Activities, Big Data.

Social Sciences – Minimum Living Standards, Trends in Politics and Democracy.

CONFERENCES AND SEMINARS

Palliative and End of Life Care

On October 14th, POST hosted a seminar on palliative and end of life care. This event brought together experts from government, the NHS, academia and the third sector with parliamentarians to discuss the new approach and challenges to providing high quality care, including attitudes towards talking about death and dying, education and training, and monitoring standards of care and outcomes. The seminar was chaired by Baroness Finlay of Llandaff, Professor of Palliative Medicine at Cardiff University, Palliative Care Clinical Lead for Wales and Vice-chair of All-Party Parliamentary Group on Hospice and Palliative Care. It featured presentations from: Dr Bee Wee, NHS England's National Clinical Director for End of Life Care, NHS England and Chair of the former Leadership Alliance for the Care of Dying People (LACDP); Simon Chapman, Director of Policy and Parliamentary Affairs at the National Council for Palliative Care; Dr Fliss Murtagh, Reader and Consultant in Palliative Medicine, Cicely Saunders Institute, King's College London..

Preventing Mitochondrial Disease

On 16th October, POST hosted a seminar on the clinical use of two new treatments to prevent serious mitochondrial disease. This seminar aimed to inform the debate on the proposed regulations by giving parliamentarians access to the scientists developing the new treatments, the regulators who may have to implement them and those at the forefront of the debate about their potential ethical and social impacts. It was chaired by Baroness O'Neill of Bengarve and included presentations by Professors Doug Turnbull (Director Wellcome Trust Centre for Mitochondrial Research), Mike Parker (Director Ethox Centre, University of Oxford), Jackie Leach Scully (Social Ethics & Bioethics, Newcastle University), Robin Lovell Badge (MRC National Institute for Medical Research) and Hannah Verdin (Head of Regulatory Policy, HFEA).

National Pollinator Strategy

On 28th October, POST hosted a seminar on the evidence for the measures set out in the National Pollinator Strategy. This followed previous POST events, and last year's POSTnote on reversing pollinator decline at the request of Sarah Newton MP, who chaired the event. Presentations were given by Professor Simon Potts, Professor of Biodiversity and Ecosystem Services, The University of Reading, Dr Christopher Connolly, Reader in Neuroscience, University of Dundee, Professor Jane Memmott, Professor of Ecology, University of Bristol and Dr Adam Vanbergen, Invertebrate Ecologist, Centre for Ecology & Hydrology.

Innovation and the Future of the UK Economy

On 5th November, POST hosted an event on innovation and the future of the UK economy. This brought together Parliamentarians and practitioners for a conversation exploring how to improve further the UK innovation system and what it might look like in 20 years' time. The discussion was chaired by Liam Byrne MP, with presentations from: Avi Hasson, Chief Scientist, Ministry of Economy, Israel; Kevin Baughan, Director, Innovation Programmes, Innovate UK (formerly Technology Strategy Board); Sir John O'Reilly, Director General of Knowledge and Innovation, Department for Business, Innovation and Skills; and Sherry Coutu, entrepreneur and investor.

Big Data and Governance: balancing risks and rewards

On 6th November, POST hosted a seminar that brought together the work undertaken by POST throughout 2014 on Big Data. Over 150 people attended. The discussion was chaired by Dr Chris Tyler – with contributions from: Adam Afriyie MP; Professor Amanda Chessell, IBM Distinguished Engineer and Master Inventor and Visiting Professor, Department of Computer Science, University of Sheffield; Professor Carol Dezateux, Professor of Paediatric Epidemiology and Scientific Director and Principal Investigator of the Life Study, UCL Institute of Child Health; Chris Fleming, Head of Data and Analytics, Government Office for Science; Christopher Graham, Information Commissioner; Dr Susan Grant-Muller, Co-Investigator to the ESRC Consumer Data Research Centre and Senior Lecturer, Institute for Transport Studies, University of Leeds; Carl Miller, co-founder and Research Director of the Centre for the Analysis of

Social Media, Demos; Matthew Rice, Advocacy Officer, Privacy International; Dr Emma Uprichard, Associate Professor, Centre for Interdisciplinary Methodologies, University of Warwick.

Annual Reception: Information Age

On 6th November, POST's Annual Reception followed the Big Data seminar, and continued the theme by partnering with the Science Museum to showcase its then newly opened Information Age exhibition. Attendees heard from Sir Tim Berners-Lee, inventor of the World Wide Web, Adam Afriyie MP; Jean Franczyk, Deputy Director of the Science Museum; and Martin Howell, Worldwide Communications Director at Cubic Transportation Systems.

STAFF, FELLOWS AND INTERNS AT POST

Fellows

Dr Anusha Panjwani, Pirbright Institute and Harvard University
Beth Brockett, University of Lancaster, British Ecological Society
Kimberley Pyle, University of Cardiff, Natural Environment Research Council

Dr Zoë Fritz, University of Warwick, Wellcome Trust Ethics and Society Programme

Joanna Scales, Rothamsted, Biotechnology and Biological Research Council

Daniel McDowell, Queen's University Belfast, Institute of Food Science and Technology

Rachel Stocker, University of Durham, British Psychological Society
Christopher Emmott, Imperial College London, Institute of Physics
Thomas Kriechbaumer, Cranfield University, Engineering and Physical Sciences Research Council

Catherine Watkinson, Imperial College London, Science and Technology Facilities Council

Edward Gillen, University of Oxford, Science and Technology Facilities Council, has been working with the House of Lords Science and Technology Committee.

Wendy Carr, Newcastle University, Institution of Chemical Engineers, was placed with the House of Commons Library Science and Environment Section.



HOUSE OF COMMONS LIBRARY SCIENCE AND ENVIRONMENT SECTION



Scientists and other staff in the Science and Environment Section provide confidential, bespoke briefing to Members and their offices on a daily basis. They also provide support to Commons Select Committees, and produce longer notes and research papers which can be accessed on line at <http://www.parliament.uk/topics/topical-issues.htm>

Summaries of recently updated briefings are opposite.

For further information contact:
Sarah Hartwell-Naguib
Head of Section
Tel: 020 7219 1665
email:
hartwellnaguibs@parliament.uk

RECENT PUBLICATIONS

Mitochondrial Donation

14.10.14 | SN06833

This provides a summary of the role of mitochondria, mitochondrial disease and the proposed new techniques. It also outlines the investigations into these techniques that took place prior to the publication of draft regulations; two HFEA scientific reviews of the safety and efficacy of methods (2011 and 2013), an ethical review of the techniques for mitochondrial replacement undertaken by the Nuffield Council on Bioethics and an HFEA public consultation. The main safety and ethical considerations associated with the introduction of these techniques into clinical practice are discussed. It also provides a summary of the recent consultation on draft regulations and the 2014 update to the scientific reviews by the expert panel at the HFEA. Overviews of recent Parliamentary debates are included in the note.

Ebola Outbreak 2014

22.10.14 | SN06999

The 2014 Ebola outbreak started in Guinea in December 2013 and now Guinea, Sierra Leone and Liberia are all severely affected. It is the largest outbreak to date. By January 2015 there were over 9,000 confirmed or suspected cases. This provides an overview of the disease, the international and UK responses to the 2014 outbreak and an outline of the experimental treatments being considered.

Online safety: Content filtering by UK Internet Service Providers (ISPs)

21.11.14 | SN07031

In July 2013, Internet Service Providers (ISPs) agreed voluntarily to offer "default-on" adult content internet filters on all new and existing home network customers. Ofcom has reviewed the implementation of the network filtering which it expects to be completed by the end of 2014. This summarises the background to these decisions, reviews its implementation and sets out some of the arguments opposed to the introduction of default on network filters.

The Forestry Commission and the sale of public forests in England

1.12.14 | SN05734

Following criticism of the Government's aborted plans to sell parts of the Public Forest Estate, in January 2013 it signalled its intention to establish a new public body to manage the forestry estate in its Forestry and Woodlands Policy Statement. Due to constraints in the parliamentary timetable no legislation to establish this body has yet been made.

In July and October 2014, environmental groups raised concerns that the Infrastructure Bill could be used to sell off public forest land, despite government reassurances to the contrary. In November 2014, the Government moved amendments to the Bill ensuring that the Bill could not be used to sell off the public forest estate.

Standardised packaging of tobacco products

3.10.14 (amended 2.12.14) | SN06175

Standardised packaging (or 'plain packaging') of tobacco products is taken to mean the removal of all attractive promotional aspects. Except for the brand name (which would be presented in a standardised way), all other trademarks, logos, colour schemes and promotional graphics would be prohibited. The package itself would be standardised and display only information (such as health warnings) required by law.

This gives an overview of the debate. It is not a comprehensive account of the arguments for and against the use of standardised packaging or an evaluation of the different views expressed as to the impact that standardised packaging might have on public health, the incidence of smuggling and the compliance costs to business. The Government's summary to its public consultation looks in detail at the range of views.

Mobile Coverage in the UK: Government plans to tackle 'mobile not-spots' 2014

19.12.14 | SN07069

The Government has identified two issues with mobile coverage in the UK: 'not-spots' – areas where there is currently no coverage available;

and 'partial not-spots' – areas which have coverage from some but not all of the 4 mobile networks.

95% of UK households use mobile phones and 16% have no voice landline at all, whilst 71% of businesses rated mobile phones as crucial or very important to their business. Currently, 99% of premises are covered outdoors by at least one Mobile Network Operator (MNOs) and 97% are covered by all three of the MNOs that operate 2G networks. For 3G services, 84% of UK premises are covered outdoors by all four MNOs and 35% of premises have coverage from Vodafone, EE and O2 for 4G.

UK Fishing Quota Agreements for 2015

22.12.14 | SN07071

Under the Common Fisheries Policy (CFP), every year annual quotas for fish species in EU waters are agreed by Ministers. 2015 is the first year that fishing opportunities are being set under the rules of the reformed Common Fisheries Policy (CFP). This summarises the negotiations and decisions taken over UK fishing quota agreements for 2015.

Garden Cities

31.12.14 (updated from 5.6.14) | SN06867

In the Budget 2014 the Government announced that it would support a new Garden City at Ebbsfleet in Kent, for up to 15,000 new homes based on existing brownfield land, to be driven forward by a development corporation with compulsory purchase powers. In April 2014 the Government published a prospectus Locally-led Garden Cities setting out a support package for local areas which are interested in forming a new garden city. Proposals put forward should have the full backing of all local authorities in which the new garden city would be sited and should be at or above a level of 15,000 homes. At the same time that the Prospectus was published the Government also launched the Large Sites Infrastructure Programme, which is aimed at accelerating the development of large housing sites.

The practicalities of how garden cities should be funded has divided expert opinion. Some private companies have pledged to invest in new settlements. A number of new homes are already planned at Ebbsfleet and information about these proposals is available online.

Planning for Onshore Windfarms

5.1.15 (updated from 5.3.14) | SN04370

The planning process used to determine onshore wind development will depend on the size of the proposed development. Wind farms which have an output of over 50MW will go through a "development consent" process and will be determined by the Secretary of State. Wind farms under 50MW will be determined by the relevant local planning authority. There are also some permitted development rights for small domestic wind turbines, where planning permission would not be required at all.

Some examples of reasons for acceptance and rejection of wind farms are set out in this note. Statistics on this are available from the Government's Renewables Planning Database Project, and the Renewables UK, UK Wind Energy Database (UKWED).

ACTIVITIES

Since October, in addition to providing bespoke briefings for MPs, and publishing briefing papers such as those highlighted above, the section has prepared debate packs, containing briefing and supporting press and parliamentary material, for debates on: Foetal alcohol syndrome; Antibiotic resistance; National pollinator strategy; Oral Hormone pregnancy tests; Coalfield Communities; UK Drugs Policy; Assessment of the second year of the badger culls; Situation in the dairy industry; Physical inactivity and public health; Preparations for flooding in winter 2014-15; Fracking; Illegal encampments in the East of England; Management of UK sea bass stock; Availability and pricing of branded medicines on the NHS; Fishing industry; Funding for Kew Gardens; Food banks; and Effect of the Contract for Difference allocation process on offshore wind developments.

Continuing the section's outreach to the academic world, Enquiry Executive, Jim Camp, Library Clerks, Emma Downing and Louise Smith, went to the University of Bristol in October to meet academics. They gave a presentation about their work, and participated in sessions on global change, food security and future cities.

The section spent time at Lancaster Environment Centre in November meeting researchers from the Lancaster Environment Centre and Energy Lancaster. This was the section's second visit to Lancaster and resulted in meetings with academics working on subjects such as biomass, fracking and renewables. Also in December, Library Clerk, Dr Sarah Barber took part in the Royal Society Pairing Scheme opening event on 24 November 2014. The Science in Parliament session for academics on the scheme involved presentations and a panel discussion.

In December the section held a *Library talks* event on food waste, arranged and presented at by POST Fellow Wendy Carr, alongside a Director from the Waste & Resources Action Programme (WRAP). Wendy started her placement with the section in September and published a note on Food Waste in preparation for this. Later that month, Enquiry Executive, Jacqueline Baker, participated in a Constituency Roadshow in Swansea to promote Library research services to constituency staff.

In December, Jacqueline, together with Library Clerks, Ed White and Elena Ares, travelled to Cardiff and attended a conference on Energy Policy in Wales, and met with counterparts at the Welsh Assembly – including Kathryn Potter, Head of the Welsh Assembly Research Service and Graham Winter, Head of Research (planning, building, land and energy) and discussed future plans for collaborative working.

The Section also contributed topical pieces to the Library's blog such as Public Forest Estate Sell-off (<http://commonslibraryblog.com/2014/12/08/public-forest-estate-sell-off-what-next/#more-1652>).



SELECTED DEBATES

Listed opposite (grouped by subject area) is a selection of Debates on matters of scientific interest which took place in the House of Commons, House of Lords or Westminster Hall between 13th October 2014 and 3rd February 2015.

A full digest of debates and PQs on scientific issues during the 2013/14 and to date in the 2014/15 sessions of Parliament can be found at <http://www.scienceinparliament.org.uk/publications/uk-digests/>

AGRICULTURE, ENVIRONMENT AND FOOD

National Pollinator Strategy	16.10.14	HoC 529	Sarah Newton
Food Security	27.11.14	HoC 337WH	Anne McIntosh
Food Hygiene Rating Scheme	11.12.14	HoL GC550	Lord Rooker
Bioeconomy	10.12.14	HoL GC489	Lord Krebs

CLIMATE CHANGE AND ENERGY

Communicating Climate Science	23.10.14	HoC 315WH	Andrew Miller
IPCC Fifth Assessment Report	20.11.14	HoC 153WH	Tim Yeo
Carbon Capture and Storage	20.11.14	HoC 176WH	Tim Yeo
Fracking	25.11.14	HoC 195WH	Norman Baker

DRUGS AND HEALTH

Antibiotic Resistance	15.10.14	HoC 101WH	Julian Sturdy
Medical Innovation Bill	24.10.14	HoL 859	
Off-patent Drugs Bill	7.11.14	HoC 1106	Jonathan Evans
NHS: Health Improvements	26.11.14	HoL GC332	Lord Kakkar
Branded Medicines (NHS)	4.12.14	HoC 525	Andrew Lansley
Drugs (Ultra-rare Diseases)	20.1.15	HoC 23WH	Greg Mulholland
Human Papilloma Virus	20.1.15	HoL 1278	Lord Patel of Bradford
Human Fertilisation and Embryology	3.2.15	HoC 160	Jane Ellison

IT, TELECOMMUNICATIONS AND BROADCASTING

Cyber-bullying and Digital Anonymity	23.10.14	HoC 1146	Charlie Elphicke
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SKILLS

Young People: Alternatives to University	23.10.14	HoL 810	Lord Monks
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TRANSPORT

Autonomous Vehicles	16.10.14	HoL 397	Lord Borwick
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MISCELLANEOUS

Kew Gardens	16.12.14	HoC 463WH	Zac Goldsmith
Valedictory Speech	16.12.14	HoL 141	Lord Jenkin

SCIENCE DIRECTORY

Alzheimer's Research UK

Defeating Dementia

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Alzheimer's Research UK is the UK's leading dementia research charity. Currently, we support 125 projects worth over £23.3m and have committed nearly £60m to research since the charity began. As research specialists, we fund pioneering research at leading universities across the UK and the globe with the aim of defeating dementia. Our expertise helps bring together leading dementia scientists to share ideas and understanding. We work with people with dementia to reflect their concerns and firmly believe that science holds the key to defeating dementia.

Association of the British Pharmaceutical Industry



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The Association of the British Pharmaceutical Industry (ABPI) represents innovative research-based biopharmaceutical companies, large, medium and small, leading an exciting new era of biosciences in the UK. Our industry, a major contributor to the economy of the UK, brings life-saving and life-enhancing medicines to patients. Our members are researching and developing over two-thirds of the current medicines pipeline, ensuring that the UK remains at the forefront of helping patients prevent and overcome diseases. Topics we focus on include:

- All aspects of the research and development of medicines including clinical research and licensing
- Stratified medicine
- Vaccines, biosimilars, small and large molecules, cell therapy and regenerative medicine

AIRTO



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AIRTO – Association of Innovation, Research & Technology Organisations – is the foremost membership body for the UK's innovation, research and technology sector, representing 80% of organisations in the sector.

AIRTO's members deliver vital innovation and knowledge transfer services which include applied and collaborative R&D, (frequently in conjunction with universities), consultancy, technology validation and testing, incubation of commercialisation opportunities and early stage financing. AIRTO members have a combined turnover of over £5.5bn from clients both at home and outside the UK, and employ over 47,000 scientists, technologists and engineers.

AMPS

AMPS

The Association of
Management and
Professional Staffs.

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Website: www.amps-tradeunion.com

We are a Trades Union for Management and Professional Staff working in the pharmaceutical, chemical and allied industries.

We also have a section for Professional Divers working globally. We represent a broad base of both office and field based staff and use our influence to improve working conditions on behalf of our members.

We are experts in performance based and field related issues and are affiliated to our counterparts in EU Professional Management Unions.



Biochemical Society
Advancing Molecular Bioscience

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The Biochemical Society exists for the advancement of the molecular and cellular biosciences; both as an academic discipline and their impact on areas of science including biotechnology, agriculture, and medicine. We achieve our mission through our publications and journals, scientific meetings, educational activities, policy work, awards and grants to scientists and students. The Biochemical Society is the largest discipline-based learned society in the biosciences with 7000 members.

The British Ecological Society



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Twitter: @BESPolicy

The British Ecological Society's mission is to generate, communicate and promote ecological solutions. The Society has over 5,000 members worldwide, publishes five internationally renowned scientific journals and organises the largest scientific meeting for ecologists in Europe. Through its grants, the BES supports ecologists in developing countries, public engagement and research. The BES informs and advises Parliament and Government on ecological issues and is committed to ensuring that policy-makers have access to the best available evidence. The BES welcomes requests for assistance from parliamentarians.

British In Vitro Diagnostics Association (BIVDA)

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BIVDA is the UK industry association representing companies who manufacture and/or distribute the diagnostics tests and equipment to diagnose, monitor and manage disease largely through the NHS pathology services. Increasingly diagnostics are used outside the laboratory in community settings and also to identify those patients who would benefit from specific drug treatment particularly for cancer.

British Nutrition Foundation



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The British Nutrition Foundation (BNF), a registered charity, delivers impartial, authoritative and evidence-based information on food and nutrition. Its core purpose is to make nutrition science accessible to all, working with an extensive network of contacts across academia, education and the food chain, and through BNF work programmes focussing on education in schools and nutrition science communication.



BRITISH PHARMACOLOGICAL SOCIETY

Today's science, tomorrow's medicines

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The British Pharmacological Society is the primary UK learned society concerned with research into drugs and the way they work. Our 3000+ members work in academia, industry, regulatory agencies and the health services, and many are medically qualified. We cover the whole spectrum of pharmacology, including laboratory, clinical, and toxicological aspects. Enquiries about the discovery, development and application of drugs are welcome.

The British Psychological Society



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The British Psychological Society is an organisation of 50,000 members governed by Royal Charter. It maintains the Register of Chartered Psychologists, publishes books, 11 primary science Journals and organises conferences. Requests for information about psychology and psychologists from parliamentarians are very welcome.



The British Society for Antimicrobial Chemotherapy

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www.e-opat.com | www.nas-pps.com
www.appg-on-antibiotics.com
www.bsacsurv.org

The BSAC is an inter-professional organisation with over forty years of experience and achievement in antibiotic education, research and leadership. The Society has an active international membership and:

- Is dedicated to saving lives through the effective use and development of antibiotics, now and in the future.
- Communicates effectively about antibiotics and antibiotic usage via workshops, professional guidelines and its own high impact international journal, the Journal of Antimicrobial Chemotherapy.
- Is home to the UK-led global initiative Antibiotic Action
- Serves as secretariat to the All Party Parliamentary Group on Antibiotics

British Society for immunology

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The BSI is one of the oldest, largest and most active immunology societies in the world. We have over 5,000 members who work in all areas of immunology, including research and clinical practice.

The BSI runs major scientific meetings, education programmes and events for all ages. We disseminate top quality scientific research through our journals and meetings and we are committed to bringing the wonders and achievements of immunology to as many audiences as possible.

British Society of Soil Science



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The British Society of Soil Science (BSSS) or "BS cubed" as it is fondly known was founded in 1947 by a number of eminent British soil scientists. It was formed with the aims: to advance the study of soil; to be open to membership from all those with an interest in the study and uses of soil; and to issue an annual publication.

Brunel University London



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Brunel University London is an international research active university with 3 leading research institutes:

Institute of Energy Futures: Led by Professor Savvas Tassou, the main themes of the Institute are *Advanced Engines and Biofuels, Energy Efficient and Sustainable Technologies, Smart Power Networks, and Resource Efficient Future Cities*.

Institute of Materials and Manufacturing: The main themes of research are *Design for Sustainable Manufacturing, Liquid Metal Engineering, Materials Characterisation and Processing, Micro-Nano Manufacturing, and Structural Integrity*. The centre is led by Professor Luiz Wrobel.

Institute of Environment, Health and Societies: Professor Susan Jobling leads this pioneering research institute whose themes are *Health and Environment, Healthy Ageing, Health Economics Synthetic Biology, Biomedical Engineering and Healthcare Technologies, and Social Sciences and Health*.

Brunel University London offers a wide range of expertise and knowledge, and prides itself on having academic excellence at the core of its offer, and was ranked in the recent REF as 33rd in the UK for Research Power (average quality rating by number of submissions) and described by The Times Higher Education as one of the real winners of the REF 2014.

Cavendish Laboratory



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The Cavendish Laboratory houses the Department of Physics of the University of Cambridge.

The research programme covers the breadth of contemporary physics

Extreme Universe: Astrophysics, cosmology and high energy physics

Quantum Universe: Cold atoms, condensed matter theory, scientific computing, quantum matter and semiconductor physics

Materials Universe: Optoelectronics, nanophotonics, detector physics, thin film magnetism, surface physics and the Winton programme for the physics of sustainability

Biological Universe: Physics of medicine, biological systems and soft matter

The Laboratory has world-wide collaborations with other universities and industry



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www.thefactsabout.co.uk

CTPA is the UK trade association representing manufacturers of cosmetic products and suppliers to the cosmetic products industry. 'Cosmetic products' are legally defined and subject to stringent EU safety laws. CTPA is the authoritative public voice of a vibrant and responsible UK industry trusted to act for the consumer; ensuring the science behind cosmetics is fully understood.

Clifton Scientific Trust



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Clifton Scientific Trust Ltd is registered charity 1086933

The Council for the Mathematical Sciences



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The Council for the Mathematical Sciences is an authoritative and objective body that works to develop, influence and respond to UK policy issues affecting mathematical sciences in higher education and research, and therefore the UK economy and society by:

- providing expert advice;
- engaging with government, funding agencies and other decision makers;
- raising public awareness; and
- facilitating communication between the mathematical sciences community and other stakeholders

Eli Lilly and Company Ltd



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Lilly UK is the UK affiliate of a major American pharmaceutical manufacturer, Eli Lilly and Company of Indianapolis. This affiliate is one of the UK's top pharmaceutical companies with significant investment in science and technology including a neuroscience research and development centre and bulk biotechnology manufacturing operations.

Lilly medicines treat schizophrenia, diabetes, cancer, osteoporosis, attention deficit hyperactivity disorder, erectile dysfunction, depression, bipolar disorder, heart disease and many other diseases.

Energy Institute



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The Energy Institute (EI) is the chartered professional body for the energy sector, supporting over 20,000 individuals and 250 companies worldwide. The EI provides learning and networking opportunities, professional recognition and technical and scientific knowledge resources on energy in all its forms and applications.

The EI's purpose is to develop and disseminate knowledge, skills and good practice towards a safe, secure and sustainable energy system. It addresses the depth and breadth of the energy sector and informs policy by providing a platform for debate and scientifically-sound information.

A registered charity, the EI serves society with independence, professionalism and a wealth of expertise in all energy matters.



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EngineeringUK is an independent organisation that promotes the vital role of engineers, engineering and technology in our society. EngineeringUK partners business and industry, Government and the wider science and technology community: producing evidence on the state of engineering; sharing knowledge within engineering, and inspiring young people to choose a career in engineering, matching employers' demand for skills.

Fera



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Fera provides expert analytical and professional services to governments, agrichemical companies, food retailers, manufacturers and farmers to facilitate safety, productivity and quality across the agrifood supply chain in a sustainable and environmentally compatible way.

Fera uses its world leading scientific expertise to provide robust evidence, rigorous analysis and professional advice to governments, international bodies and companies worldwide. Our food integrity, plant health, agri-tech and agri-informatics services ensure that our customers have access to leading edge science, technology and expertise.

First Group



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FirstGroup is the leading transport operator in the UK and North America.

Our services help create strong, vibrant and sustainable local economies and our opportunity is to be the provider of choice for our customers and communities. During the last year around 2.5 billion people relied on us to get to work, to education, to visit family and friends and much more.

GAMBICA Association Ltd



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GAMBICA Association is the UK trade association for instrumentation, control, automation and laboratory technology. The association seeks to promote the successful development of the industry and assist its member companies through a broad range of services, including technical policy and standards, commercial issues, market data and export services.

The Geological Society



The Geological Society

serving science & profession

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The Geological Society is the national learned and professional body for Earth sciences, with 11,500 Fellows (members) worldwide. The Fellowship encompasses those working in industry, academia and government, with a wide range of perspectives and views on policy-relevant science, and the Society is a leading communicator of this science to government bodies and other non-technical audiences.

Glass and Glazing Federation



Glass and Glazing Federation

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The GGF is the main representative organisation for companies involved in all aspects of the manufacture of flat glass and products and services for all types of glazing, in commercial and domestic sectors.

Members include companies that manufacture and install energy efficient windows, in homes and commercial buildings, the performance glass used in every type of building from houses to high-rise tower blocks and the components that are used to manufacture every type of glazing.



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IFST is the independent qualifying body for food professionals in Europe. Membership is drawn from all over the world from backgrounds including industry, universities, government, research and development and food law enforcement.

IFST's activities focus on disseminating knowledge relating to food science and technology and promoting its application. Another important element of our work is to promote and uphold standards amongst food professionals.

Institute of Marine Engineering, Science and Technology (IMarEST)



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Established in London in 1889, the IMarEST is a leading international membership body and learned society for marine professionals, with over 15,000 members worldwide. The IMarEST has an extensive marine network of 50 international branches, affiliations with major marine societies around the world, representation on the key marine technical committees and non-governmental status at the International Maritime Organization (IMO) as well as other intergovernmental organisations.

Institute of Measurement and Control



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The Institute of Measurement and Control provides a forum for personal contact amongst practitioners, publishes learned papers and is a professional examining and qualifying organisation able to confer the titles Eurlng, CEng, IEng, EngTech; Companies and Universities may apply to become Companions. Headquartered in London, the Institute has a strong regional base with 15 UK, 1 Hong Kong and 1 Malaysia Local Section, a bilateral agreement with the China Instrument Society and other major international links.

IOP Institute of Physics

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The Institute of Physics is a leading scientific society. We are a charitable organisation with a worldwide membership of more than 50,000, working together to advance physics education, research and application.

We engage with policymakers and the general public to develop awareness and understanding of the value of physics and, through IOP Publishing, we are world leaders in professional scientific communications.

In September 2013, we launched our first fundraising campaign. Our campaign, Opportunity Physics, offers you the chance to support the work that we do.

Visit us at www.iop.org, follow us @physicsnews



Institute of Physics and Engineering in Medicine

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IPEM is a registered, incorporated charity for the advancement, in the public interest, of physics and engineering applied to medicine and biology. Its members are medical physicists, clinical and bio-engineers, and clinical technologists. It organises training and CPD for them, and provides opportunities for the dissemination of knowledge through publications and scientific meetings. IPEM is licensed by the Science Council to award CSci, RSci and RSciTech, and by the Engineering Council to award CEng, IEng and EngTech.



The Institution of Chemical Engineers

With over 40,000 members in 120 countries, IChemE is the global membership organisation for chemical engineers. A not for profit organisation, we serve the public interest by building and sustaining an active professional community and promoting the development, understanding and application of chemical engineering worldwide.

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Kuala Lumpur | London | Melbourne | Rugby | Singapore | Wellington

Institution of Civil Engineers



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Established in 1818 and with over 85,000 members in 167 countries worldwide, ICE is a leading source of expertise in infrastructure and engineering policy and is widely seen as the independent voice of infrastructure. ICE provides advice to all political parties and works with industry to ensure that civil engineering and construction remain major contributors to the UK economy.

Institution of Engineering Designers



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The only professional membership body solely for those working in engineering and technological product design. Engineering Council and Chartered Environmentalist registration for suitably qualified members. Membership includes experts on a wide range of engineering and product design disciplines, all of whom practise, manage or educate in design. **New for 2015: Chartership for Product Designers (CTPD).**



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The IET is a world leading professional organisation, sharing and advancing knowledge to promote science, engineering and technology across the world. Dating back to 1871, the IET has 150,000 members in 127 countries with offices in Europe, North America, and Asia-Pacific.

Institution of Mechanical Engineers



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The Institution provides politicians and civil servants with information, expertise and advice on a diverse range of subjects, focusing on manufacturing, energy, environment, transport and education policy. We regularly publish policy statements and host political briefings and policy events to establish a working relationship between the engineering profession and parliament.

LGC



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LGC is an international science-based company and market leader in the provision of analytical, forensic and diagnostic services and reference standards to customers in the public and private sectors.

Under the Government Chemist function, LGC fulfils specific statutory duties as the referee analyst and provides advice for Government and the wider analytical community on the implications of analytical chemistry for matters of policy, standards and regulation. LGC is also the UK's designated National Measurement Institute for chemical and biochemical analysis.

With headquarters in Teddington, South West London, LGC has 36 laboratories and centres across Europe and at sites in China, Brazil, India, South Africa and the US.



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As the world's oldest biological society, the Linnean Society of London is an essential forum and meeting point for those interested in natural history. The Society holds regular public events, publishes three peer-reviewed journals, promotes the study of the natural world with several educational initiatives and is home to a world famous library and collection of natural history specimens. The Society's Fellows have a considerable range of biological expertise that can be harnessed to inform and advise on scientific and public policy issues.

A Forum for Natural History

L'ORÉAL UK AND IRELAND

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L'Oréal employs more than 4,000 researchers world-wide and dedicates over €850 million each year to research and innovation in the field of healthy skin and hair. The company supports women in science research through the L'Oréal UNESCO For Women In Science Programme and engages young people with science through the L'Oréal Young Scientist Centre at the Royal Institution. L'Oréal also collaborates with a vast number of institutions in the UK and globally.

Marine Biological Association



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Since 1884 the Marine Biological Association has been delivering its mission 'to promote scientific research into all aspects of life in the sea, including the environment on which it depends, and to disseminate to the public the knowledge gained.' The MBA represents its members in providing a clear independent voice to government on behalf of the marine biological community. It also has an extensive research programme and a long history as an expert provider of advice for the benefit of policy makers and wider society.

Met Office



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The Met Office doesn't just forecast the weather on television. Our forecasts and warnings protect UK communities and infrastructure from severe weather and environmental hazards every day – they save lives and money. Our Climate Programme delivers evidence to underpin Government policy through the Met Office Hadley Centre. Our Mobile Meteorological Unit supports the Armed Forces around the world. We build capacity overseas in support of international development. All of this built on world-class environmental science.

National Physical Laboratory



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The National Physical Laboratory (NPL) is the United Kingdom's national measurement institute, an internationally respected and independent centre of excellence in research, development and knowledge transfer in measurement and materials science. For more than a century, NPL has developed and maintained the nation's primary measurement standards – the heart of an infrastructure designed to ensure accuracy, consistency and innovation in physical measurement.

Natural History Museum



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We challenge the way people think about the natural world – its past, present and future

We use our unique collection and unrivalled expertise to tackle the biggest challenges facing the world today.

We are leaders in the scientific understanding of the origin of our planet, life on it and can predict the impact of future change.

We study the diversity of life and the delicate balance of ecosystems to ensure the survival of our planet.

We help enable food security, eradicate disease and manage resource scarcity.

We inspire people to engage with science to solve major societal challenges.

NEF: The Innovation Institute



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The Innovation Institute aims to drive innovation and growth in science, technology and engineering to achieve growth, prosperity and wellbeing in the UK. Our partners, clients and stakeholders include:

- Businesses
- Education providers
- Government bodies

New Engineering Foundation, our charitable arm, focusses on SciTech skills development. NEF work in vocational training and further education is supported by a Panel drawn from key industries.

Our Institute of Innovation and Knowledge Exchange is a professional body and a "do tank", led by the Innovation Council to support the role of innovation in society.



THE UNIVERSITY OF NORTHAMPTON

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The University of Northampton is a Top 50 UK University*. We are committed to science education through initial teacher training, a STEM Ambassador network which works within the community and teaching and research to doctoral level. We are an Ashoka U 'Changemaker Campus' status university recognising our commitment to social innovation and entrepreneurship.

(*Guardian University Guide 2015)



The University of Nottingham

UNITED KINGDOM • CHINA • MALAYSIA

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With 43,000 students and campuses in Nottingham, China and Malaysia, The University of Nottingham is 'the nearest Britain has to a truly global university'. With more than 97 per cent of research at the University recognised internationally according to the Research Excellence Framework 2014, the University is ranked in the top 1% of the world's universities by the QS World University Rankings.

PHARMAQ PHARMAQ Ltd

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PHARMAQ is the only global pharmaceutical company with a primary focus on aquaculture. Our mission is to provide environmentally sound, safe and efficacious health products to the global aquaculture industry through targeted research and the commitment of dedicated people. We have a product portfolio that includes over 20 fish vaccines along with specialist feed additives, anaesthetics, antibiotics, sea lice treatments and biocide disinfectants. Through our sister company, PHARMAQ Analytiq, we also offer a range of diagnostics services that can be used to help safeguard fish welfare and improve productivity.

The Physiological Society

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Physiology is the science of how molecules, cells and organs work in the body. Representing over 3000 life scientists, The Physiological Society supports scientific research through its grants schemes, conferences and its three open access journals.

The Society also supports the teaching of physiology in schools and universities, and works to promote an understanding of physiology amongst policy-makers and the general public.

Prospect



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Prospect is an independent, thriving and forward-looking trade union with 117,000 members across the private and public sectors and a diverse range of occupations. We represent scientists, technologists and other professions in the civil service, research councils and private sector.

Prospect's collective voice champions the interests of the engineering and scientific community to key opinion-formers and policy makers. With negotiating rights with over 300 employers, we seek to secure a better life at work by putting members' pay, conditions and careers first.



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The Rainbow Seed Fund is a £24m, early-stage venture capital fund dedicated to kick-starting promising technology companies emerging from the UK science base. The Fund is backed by ten UK publicly-funded research organisations and the Department of Business, Innovation and Skills and holds investments in some of the UK's most innovative companies in areas as diverse as novel antibiotics, research into Alzheimer's disease, "green" chemicals and airport security. The Fund is managed by Midven, a specialist venture capital company. We are prepared to invest early and help build a proposition to attract additional investment and get to market.



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Risk Solutions provide decision-support where there is a high degree of complexity, uncertainty or risk. A small highly motivated and client focused team we deliver:

- policy design, appraisal and decision support
- strategy development and asset management
- training, coaching and guidance
- evaluation assurance and organisational review, and
- risk assessment and research.

We tailor solutions to clients' needs, combining traditional qualitative and quantitative methods with cutting-edge participative modelling and decision analysis. We work with clients from across Government departments and agencies.



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As the UK's national academy for engineering, we bring together the most successful and talented engineers for a shared purpose: to advance and promote excellence in engineering. We have four strategic challenges: drive faster and more balanced economic growth; foster better education and skills; lead the profession; and promote engineering at the heart of society.



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RBG Kew is a centre of global scientific expertise in plant and fungal diversity, conservation, and sustainable use, housed in two world-class gardens. Kew is a non-departmental public body with exempt charitable status and receives approximately half its funding from government through Defra. The key strategic priorities of Kew's science programme are to:

- understand and conserve biodiversity
- accelerate discovery and global access to plant and fungal diversity information
- map and prioritise species and habitats most at risk
- promote sustainable local use of plants and fungi
- collect and store seed from 25% of plant species through the Millennium Seed Bank Partnership
- inspire interest in plant and fungal science and conservation

Kew's mission is to inspire and deliver science-based plant conservation worldwide, enhancing the quality of life.



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The Royal Institution (Ri) has been at the forefront of public engagement with science for over 200 years and our purpose is to encourage people to think further about the wonders of science. We run public events and the famous CHRISTMAS LECTURES®, a national programme of Masterclasses for young people in mathematics, engineering and computer science, educational activities at the L'Oréal Young Scientist Centre and policy discussions with science students. And through the Ri Channel we share the stories behind cutting-edge science with people around the world.



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The Royal Society is the UK academy of science comprising 1400 outstanding individuals representing the sciences, engineering and medicine. It has had a hand in some of the most innovative and life-changing discoveries in scientific history. Through its Fellowship and permanent staff, it seeks to ensure that its contribution to shaping the future of science in the UK and beyond has a deep and enduring impact.



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The Royal Society of Chemistry is the world's leading chemistry community, advancing excellence in the chemical sciences. With over 50,000 members and a knowledge business that spans the globe, we are the UK's professional body for chemical scientists; a not-for-profit organisation with 170 years of history and an international vision of the future. We promote, support and celebrate chemistry. We work to shape the future of the chemical sciences – for the benefit of science and humanity.



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SfAM is a UK organization, serving microbiologists internationally. It works to advance, for the benefit of the public, the science of microbiology in its application to the environment, human and animal health, agriculture, and industry. With Wiley-Blackwell, SfAM publishes five internationally acclaimed journals. Value for money and a modern, innovative and progressive outlook are its core principles. A friendly society, SfAM values integrity, honesty, and respect, and seeks to promote excellence and professionalism and to inspire young microbiologists.



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The Society for General Microbiology is the largest learned microbiological society in Europe with a worldwide membership based in universities, industry, hospitals, research institutes and schools. The Society publishes key academic journals, organises international scientific conferences and provides an international forum for communication among microbiologists. The Society promotes the understanding of microbiology to a diverse range of stakeholders, including policy-makers, students, teachers, journalists and the wider public, through a comprehensive framework of communication activities and resources.

Society for Underwater Technology



Society for Underwater Technology
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The SUT is a multidisciplinary learned society that brings together individuals and organisations with a common interest in underwater technology, ocean science, and offshore/subsea engineering. The society was founded in 1966 and has members from over 40 countries, including engineers, scientists, other professionals and students working in these areas.

Society of Biology



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The Society of Biology is a single unified voice, representing a diverse membership of individuals, learned societies and other organisations. We are committed to ensuring that we provide Government and other policy makers – including funders of biological education and research – with a distinct point of access to authoritative, independent, and evidence-based opinion, representative of the widest range of bioscience disciplines. Our vision is of a world that understands the true value of biology and how it can contribute to improving life for all.

SCI



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SCI is an inclusive, multi-disciplinary forum connecting scientists and business people to advance the commercial application of chemistry and related sciences for public benefit. SCI is open to all to join and share information, ideas, innovations and research. Members can network with specialists from sectors as diverse as food and bio-renewables, water, waste and environment, energy, materials, manufacturing and health.

Society of Cosmetic Scientists



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Advancing the science of cosmetics is the primary objective of the SCS. Cosmetic science covers a wide range of disciplines from organic and physical chemistry to biology and photo-biology, dermatology, microbiology, physical sciences and psychology.

Members are scientists and the SCS helps them progress their careers and the science of cosmetics ethically and responsibly. Services include publications, educational courses and scientific meetings.

Society of Maritime Industries



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The Society of Maritime Industries is the voice of the UK's maritime engineering and business sector promoting and supporting companies which design, build, refit and modernise ships, and supply equipment and services for all types of commercial and naval ships, ports and terminals infrastructure, offshore oil & gas, maritime security & safety, marine science and technology and marine renewable energy.

STEMNET



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STEMNET is an independent charity which enables young people to meet inspiring role models, understand real world applications of STEM and experience practical activities that bring learning and career opportunities to life. We do this through three core programmes:

- STEM Ambassadors - We run the UK network of STEM Ambassadors: over 29,000 inspiring volunteers
- STEM Clubs Programme - We provide free, expert advice and support to all schools which have set up or plan to develop a STEM Club
- Schools' STEM Advisory Network (SSAN) - We deliver free impartial advice to teachers and use our business links and partnerships to enhance the STEM curriculum in secondary schools in the UK

Universities Federation for Animal Welfare



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Registered in England Charity No: 207996

UFAW, the international animal welfare science society, is an independent scientific and educational charity. It works to improve animal lives by:

- supporting animal welfare research
- educating and raising awareness of welfare issues in the UK and overseas
- producing the quarterly scientific journal Animal Welfare and other high-quality publications on animal care and welfare
- providing advice to government departments and other concerned bodies.



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The Welding Institute is the leading institution providing engineering solutions and knowledge transfer in all aspects of manufacturing, fabrication and whole-life integrity management.

Industrial membership provides access to innovative problem-solving from one of the world's foremost independent research and technology organisations.

Non-Corporate services include membership and registration, education, training and certification for internationally recognised professional development and personnel competence assurance.

TWI provides Members and stakeholders with authoritative and impartial expert advice, knowhow and safety assurance through engineering, materials and joining technologies.

Research Councils UK

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Each year the Research Councils invest around £3 billion in research covering the full spectrum of academic disciplines from the medical and biological sciences to astronomy, physics, chemistry and engineering, social sciences, economics, environmental sciences and the arts and humanities.

Research Councils UK is the strategic partnerships of the seven Research Councils. It aims to:

- increase the collective visibility, leadership and influence of the Research Councils for the benefit of the UK;
- lead in shaping the overall portfolio of research funded by the Research Councils to maximise the excellence and impact of UK research, and help to ensure that the UK gets the best value for money from its investment;
- ensure joined-up operations between the Research Councils to achieve its goals and improve services to the communities it sponsors and works with.

Biotechnology and Biological Sciences Research Council (BBSRC)



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BBSRC invests in world-class bioscience research, innovation and training on behalf of the UK public. Our aim is to further scientific knowledge to promote economic growth, wealth and job creation and to improve quality of life in the UK and beyond. BBSRC research is helping society to meet major challenges, including food security, green energy and healthier lifespans and underpins important UK economic sectors, such as farming, food, industrial biotechnology and pharmaceuticals.

Economic and Social Research Council



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The ESRC is the UK's largest organisation for funding research on economic and social issues and is committed to supporting the very best research with wide-ranging impact. Social science contributes to greater knowledge and understanding of the many challenges our society faces today and by ensuring that ESRC-funded research makes the biggest possible impact, our research shapes public policies and makes business, voluntary bodies and other organisations more effective, as well as shaping wider society. We also develop and train the UK's future social scientists.

EPSRC

Pioneering research and skills

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EPSRC is the UK's main agency for funding research and training in engineering and physical sciences, investing around £800m a year in research and postgraduate training, to help the nation handle the next generation of technological change.

The areas covered range from information technology to structural engineering, and mathematics to materials science. This research forms the basis for future economic development in the UK and improvements for everyone's health, lifestyle and culture. EPSRC works alongside other Research Councils with responsibility for other areas of research.

Medical Research Council



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Over the past century, the MRC has been at the forefront of scientific discovery to improve human health. Founded in 1913 to tackle tuberculosis, the MRC now invests taxpayers' money in the highest quality medical research across every area of health. Thirty-one MRC-funded researchers have won Nobel prizes in a wide range of disciplines, and MRC scientists have been behind such diverse discoveries as vitamins, the structure of DNA and the link between smoking and cancer, as well as achievements such as pioneering the use of randomised controlled trials, the invention of MRI scanning, and the development of therapeutic antibodies. We also work closely with the UK's Health Departments, the NHS, medical research charities and industry to ensure our research achieves maximum impact as well as being of excellent scientific quality.

Natural Environment Research Council



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NERC is the UK's leading public funder of environmental science. We invest £330 million each year in cutting-edge research, postgraduate training and innovation in universities and research centres.

Our scientists study the physical, chemical and biological processes on which our planet and life itself depends – from pole to pole, from the deep Earth and oceans to the atmosphere and space.

We partner with business, government, the public and the wider research community to shape the environmental research and innovation agenda. Our science provides knowledge, skills and technology that deliver sustainable economic growth and public wellbeing.

Science & Technology Facilities Council



Science & Technology
Facilities Council

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The Science and Technology Facilities Council is one of Europe's largest multidisciplinary research organisations undertaking and supporting a broad range of research across the physical, life and computational sciences. We operate world class, large-scale research facilities in the UK and Europe and provide strategic advice to the UK Government on their development. We partner in two of the UK's Science and Innovation Campuses. We also manage international research projects in support of a broad cross-section of the UK research community, particularly in the fields of astronomy, nuclear physics and particle physics.

SCIENCE DIARY

THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE

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www.scienceinparliament.org.uk

Tuesday 24 February 17.30

A Science Legacy for the Next Parliament

Speakers: The Baroness Finlay of Llandaff
Andrew Miller MP

Monday 9 March 12.00-21.15

SET for Britain

Poster Competition and Exhibition

Thursday 19 March 9.30

LIGHT

British Science Week Seminar

SOCIETY OF BIOLOGY

For details visit www.societyofbiology.org

Wednesday 4 March 9.30-12 noon

Voice of the Future 2015

Young scientists and engineers have a Question Time with Sir Mark Walport, Andrew Miller MP and S&T Select Committee MPs, Rt Hon Liam Byrne MP and Rt Hon Greg Clark MP
Boothroyd Room, Portcullis House

Wednesday 11 March 10.00-12 noon

Science and the General Election 2015

A debate with science spokespersons from major parties

Moderated by Pallab Ghosh of the BBC

Boothroyd Room, Portcullis House

THE ROYAL SOCIETY

Details of all events can be found at www.royalsociety.org/events

THE ROYAL INSTITUTION

Details of future events can be found at www.rigb.org Booking is essential. For more

information and to book visit www.rigb.org
There is a charge for tickets. Members go free.

PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY

For details of events organised by POST visit <http://www.parliament.uk/mps-lords-and-offices/offices/bicameral/post/post-events/>

THE INSTITUTION OF MECHANICAL ENGINEERS

For details of events visit: www.imeche.org/events

THE LINNEAN SOCIETY OF LONDON

For details visit: www.linnean.org

More information on P&SC members' events can be found at: www.scienceinparliament.org.uk/members-news



SET for BRITAIN

Presentations by Britain's Early-Stage Researchers
in Science, Engineering, Technology and Mathematical Sciences
at the House of Commons



Monday, 9th March 2015

Biological and Biomedical Sciences Exhibition

12.00 noon - 2.15 pm

Engineering and Mathematical Sciences Exhibitions

6.15 pm - 9.00 pm

Physical Sciences Exhibition (Chemistry and Physics)

3.00 pm - 5.30 pm

Presentation of Westminster Medal

9.00 pm



WILEY



BANK OF ENGLAND

IOP Institute of Physics



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