SCIENCE IN PARLIAMENT
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Whitsun 2010

The Royal Society of Chemistry
invites you to attend the Society's

Parliamentary Links Day 2010

Science and the New Parliament

Organised by the Royal Society of Chemistry
on behalf of the science and engineering community

Tuesday 22 June at 10am
The Attlee Suite
Portcullis House
The House of Commons

Refreshments from 9.30am
Lunch from 1pm

RSC Advancing the Chemical Sciences
IOP Institute of Physics
Society of Biology
The Royal Society — Celebrating 350 Years
The Royal Academy of Engineering
Campaign for Science & Engineering in the UK
The Geological Society
IChemE Institution of Chemical Engineers

The Journal of the Parliamentary and Scientific Committee
www.scienceinparliament.org.uk

SCIENCE IN PARLIAMENT

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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.

Dr Brian Iddon
Chairman,
Editorial Board
Science in Parliament

As the outgoing Chairman of the Management Board of SiP I would like to welcome you all as the new session of Parliament begins. Many elected MPs who were active in the STEM policy area in the last Parliament have retired, and I urge all newly elected MPs to consider taking an interest in the Parliamentary and Scientific Committee, the House of Commons Science and Technology Select Committee, the Parliamentary Office of Science and Technology and all the All-Party Parliamentary Groups that promote STEM.

This is an exciting time to be involved in science and engineering policy. Since 1997 the science budget has doubled, but we are still a long way off the target expenditure on STEM of 2.5% of GDP. It is important that Parliament sustains expenditure on STEM in order to maintain Britain's position in world science, second only to the USA currently. In March, the Government announced a £40 million investment in the new International Space and Innovation Centre and a further £100 million investment in the Diamond Light Source's Phase III development, both at Harwell. Also in March, CERN announced that beams have collided at 7 Tev in the Large Hadron Collider.

Reports by the HoC Science and Technology Select Committee and Lord Oxburgh's Committee have supported the small Climatic Research Unit at the University of East Anglia against the attacks on them by global warming sceptics. Both reports contained criticisms of the CRU and the UEA. Chemists have been turning their attention recently to using carbon dioxide as a chemical feedstock. Its conversion into methanol as a transport fuel is attracting attention as is its conversion into polyols that can be converted into polymers for use in coatings, adhesives, and graphic art materials (see *Chemistry and Industry*, 22 February 2010, p 7).

Significantly, after a 12-year struggle, the European Commission has authorised cultivation of BASF's genetically modified and blight resistant potato Amflora for industrial use. Finally, congratulations to Simon Singh who has successfully stood up to the libel action taken against him by the British Chiropractic Association.

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A WELCOME BY THE PRESIDENT

The Rt Hon Lord Jenkin of Roding

While welcoming back present members of the Parliamentary and Scientific Committee to the new Parliament of 2010, I particularly wish to welcome newly elected MPs taking their seats in the House of Commons for the first time.

This Committee, the oldest All-Party Group in Parliament, has been serving the needs of Parliamentarians and of our many important and internationally recognised member organisations for over 70 years. That we are still going strong is because, not only have we adapted ourselves to the changing needs of our membership, but also because we enable informed debate on critical scientific and engineering matters affecting the whole nation. It is particularly important that we help to facilitate cross-party discussion on matters of common scientific interest, involving MPs and Peers, including the formidable body of scientific Cross-Bench Peers, working with our member organisations in the national, European or international interest.

Scientific and engineering achievements are powerful drivers for change. Parliamentarians play a vital and ever-increasing role in debating science-based policy issues with impacts far beyond the life of any one Parliament, and they must be well-informed.

While we are looking forward to the participation in our discussions of those with scientific or engineering expertise, one of our prime functions has always been to generate interest and involvement of others who, like myself, may not share that experience. They often bring different but valued perceptions to the debates in Parliament; membership of the P&SC is one of the best ways they can inform themselves.

The Committee is planning an excellent programme of meetings in Parliament and off site visits. Please take a look at our updated website where you will find this and much more information about the Committee, including online access to recent issues of 'Science in Parliament'. Anyone accessing the site through the Parliamentary server - whether locally or remotely will be logged in automatically. All others accessing the site remotely (including Parliamentarians through dial-up or existing broadband accounts) will need to login using the password - but once logged in, they have access to all of the same areas on the website as anyone accessing the site through the Parliamentary server. The password should be requested using the "Contact" facility provided on the website, which will be responded to on a regular basis by the Scientific Secretary, Eur Ing Professor Peter Simpson.

WHITHER SCIENCE IN PARLIAMENT?

John Walton
(Lord Walton of Detchant)
Kt TD MA MD DSc FRCP FMedSci

I can hardly believe that it is 65 years since I graduated in medicine. During my professional career I was much involved in clinical neurological practice and in teaching, but also undertook and supervised many research projects, principally in the field of neuromuscular disease, involving many aspects of genetics and biomedical science.

Since I was privileged to become a Crossbench Life Peer in 1989, I have taken a keen interest in parliamentary debates dealing with medicine, science and education, and have much enjoyed my membership of the Parliamentary and Scientific Committee, as its meetings have invariably been informative, stimulating, and even at times provocative. My interest in neuromuscular disease led me to become heavily involved in debates in the Upper House on issues relating to human fertilisation and embryology and stem cell research to quote but two examples.

Inevitably, during my parliamentary career I have enjoyed many scientific discussions with members of both houses, and I was privileged to serve for almost 14 years in total on the House of Lords Select Committee on Science and Technology, and to chair three disparate enquiries, examining international investment in UK science, research in the National Health Service and complementary and alternative medicine. Many reports of that Select Committee, and of its sister committee in the House of Commons, have had a major influence on government policy in the whole field of science, and I have much appreciated the seminal contributions of many members of the House of Commons who have become friends and valued colleagues. These have included, for example, Ian Gibson, former Dean of Biology at the University of East Anglia and former chairman of the House of Commons Select Committee on Science and Technology, whose treatment by his party, leading to his departure from the House, was in my opinion disgraceful. Others contributing cogently to scientific debate have been Brian Iddon, a noted chemist, Des Turner, a botanist with a higher degree in biochemistry, and Doug Naysmith, a zoologist, with a PhD in surgical science and immunology, to quote but three. And while Phil Willis MP originally qualified in education rather than in science, he has proved an able and influential chairman of the Commons Committee on Science and Technology, and more recently of the Committee on Innovation, Universities and Skills. Ian Taylor MP, graduating originally in politics and modern history, has also contributed effectively to scientific debates, succeeding Doug Naysmith as Chairman of the Parliamentary and Scientific Committee. Other MPs, not themselves scientists, who have taken an active interest in scientific issues are Bob Spink, Robert Key and Tim Boswell. Plainly, too, my medical colleagues, such as Howard Stoate, Richard Taylor and Evan Harris, have been effective contributors to scientific debate. Sadly, we have now lost a valuable contributor due to the untimely death of Ashok Kumar, a highly qualified engineer with a PhD in fluid mechanics.

Most disturbing is the fact that Evan Harris and Richard Taylor have lost their seats and most of the others whose names I have quoted have stood down. Having examined the backgrounds of the new Members of Parliament, it has been difficult to identify many who will fly the scientific banner in the new House of Commons, as so many are graduates in politics, economics, business, finance, philosophy, law and the humanities. Surely it is inconceivable that we may be faced with a scientifically illiterate House.

When I was a young doctor, my senior colleague, the late Dr Henry Miller, often said that as one ages, instead of giving technical and scientific lectures, it is customary to deliver what he called 'Whither Lectures', examining in a semi-philosophical sense the future of one's specialty. This is why I have chosen this title for an 'Opinion piece'. My concerns are heightened by question as to whether the remarkable scientific expertise now available in the Upper House, where we have one past and one current President of the Royal Society, as well as numerous distinguished exponents of the STEM disciplines of science, technology, engineering and maths (and of course medical science) will be available to serve Parliament if, as the three main political parties now wish, the Upper House is be replaced by either a wholly elected or a substantially elected chamber. As I approach my 88th birthday I imagine that my years of service in the House of Lords will soon be drawing to a close, but my concern, escalating as so many noted exponents of and supporters of science are standing down from the Commons, have led me to ask anxiously 'Whither Science in Parliament?'

PARTING SHOTS
BY DOUG NAYSMITH (PAST CHAIRMAN)


Dr Doug Naysmith

As I look back over 13 years in the House as a backbench member with major interests in Health Policy and Science Policy, I am convinced of the importance of both Select Committees and All Party Parliamentary Groups such as the Parliamentary and Scientific Committee (the P and SC) in achieving evidence-based policies. As a member of the Health Select Committee for nine years I saw clear evidence of Health Policy being influenced for the better – not least in the way our report and amendment to the Control of Smoking in Public Places legislation rendered it both workable and effective.

The P and SC, though not a statutory committee, has also been and continues to be very influential. Set up in 1939, it is the oldest backbench All Party Group and has been responsible for bringing together members of both Houses and scientists from research institutes, universities and industry to inform both 'sides' better about the views, problems and aspirations of the other. Although backbench groups continue to proliferate – there are certainly too many of them now – the P and SC is too valuable to be lost. As an officer of the P and SC for ten years (in various capacities and latterly as Chairman for four years), I have seen how much it is appreciated and needed. Having spun off POST (the Parliamentary Office of Science and Technology) and been influential in the setting up of the Science Select Committees in their various guises, there is still much for the P and SC to do as a pressure group for evidence-based policy decisions and informing Members of the possibilities. When the new Parliament meets to get properly into its stride, it is important that it takes Science and evidence-based policy seriously – and be seen to take it seriously. One of its first actions should be to set up a Science and Technology Committee, with a wide-ranging brief over all Government Departments – not just whichever Department currently houses Science.

Secondly, the new Government should make clear that it intends to protect investment in science, technology and innovation; these provide the bases from which the country's future economic growth will come and our future wealth depends on it. Encouraging words were said on this by Adam Afriyie (the then Conservative spokesperson for Science – see the Autumn 2009 edition of SiP) and I hope David Willetts, the new Minister of State in the coalition government will recognise the importance of this too.

The last Labour Government invested more, and took more notice of scientific advice from expert sources than any other previous government. It also tried to make policy decisions based on evidence rather than on political dogma or media-fashionable views. Nevertheless, there were some major failures, not least of which was to be bullied by pressure groups and exaggerated media coverage into ignoring the potential of GM technology.

There is a better story to tell in the MMR debate where eventually, unsubstantiated advice coupled with media hype has been rejected, although much damage has been done in the process to the image of immunisation; a technology which has led to the elimination of smallpox and is well on the way to eliminating polio too.

It must always be the case that governments will make decisions based on factors other than scientific evidence; although the evidence must at least be considered and the reasons explained and made available for discussion. That this did not happen in the recent controversial case of Professor David Nutt's sacking by Alan Johnson probably led to the controversy. I hope that such a case will not happen again if the new "Principles for the Treatment of Independent Scientific Advice" can be agreed and implemented by the new Government and representatives of the Scientific Community.

After thirteen wonderful years as a scientist on the back benches I cannot better Tony Blair's comment on his last day as Prime Minister, "That is that. The end."

SCIENCE AND POLITICS MUST RUB TOGETHER BETTER

Ian Taylor MP
Chairman, Parliamentary and Scientific Committee

Speaking at the awards of The Rank Prize Funds 8th February 2010 *[These prizes were established in 1972 by the late Lord Rank to encourage a greater understanding of the sciences of nutrition and optoelectronics, two areas the British film pioneer believed would be of special interest to mankind. Chair of Trustees The Earl of Selborne]*

"The union of the political and scientific estates is not like a partnership, but a marriage. It will not be improved if the two become like each other, but only if they respect each other's quite different needs and purposes. No great harm is done if in the meantime they quarrel a bit."

Don (Krasher) Price, The Scientific Estate (1965), 71.

SCIENCE PERMEATES OUR LIVES AND INFORMS OUR ACTIONS

In order to keep our economy growing, we need a new wave of educated students ready for modern scientific research, teaching and technological development. There have been so many tremendous advances in technology over the last decade or so, in fact the pace is accelerating. Every day new things are discovered and with the increase in scientific knowledge, there is an increase in demand for educated students – and politicians. Having a more scientifically literate population will not just be an advantage but a requirement. It would be assisted if we could inspire young people to appreciate that if they want to do something positive to improve the quality of life in the world, studying science is a tremendous advantage. Science and Maths are the centre of a network, connected to so many things. They influence, often without us realising it, the making of policy in a vast number of areas.

Today, scientific advice to underpin policy is more important than ever before. From neuroscience to nanotechnology, food security to climate change, the questions being asked of scientists by policy makers, the media and the public continue to multiply. Science and engineering are crucial because they underpin big political decisions facing the UK over the next twenty years. How governments deal with these issues has an impact on public opinion of the science involved. Simply to list the challenges facing today's politicians is to demonstrate the importance of science. Energy, bio-fuels, security, space and earth observation, climate change, genetic modification, mapping the human genome, dealing with pandemics, health science, medicines, communications and IT are just some of the more obvious areas that are crucial for the UK.

. . . Having a more scientifically literate population will not just be an advantage but a requirement. . .

SCIENTIFIC ADVICE TO GOVERNMENT

"There are no facts, only interpretations." – Nietzsche

The Royal Society, the world's oldest national academy of science, has as its motto: *Nullius in verba* ("Take nobody's word for it").

Recent events have raised questions about how scientists relate to politicians.

Lord Krebs has written: "Ministers look to their expert advisers for clear-cut answers, a unanimous view, and preferably one that is politically convenient. Scientific advisers are prone to disappoint on all fronts."

Last year David Nutt, Chairman of the Advisory Committee on the Misuse of Drugs, was sacked by the Home Secretary for being too outspoken about the Government's rejection of his committee's advice on the classification of cannabis and Ecstasy. He may have been outspoken, but the reaction was wrong. I challenged the Prime Minister on this matter (see note).

The recent *Principles for the Treatment of Independent Scientific Advice* sets out to Government three sensible core

principles: academic freedom, independence of operation and proper consideration of and respect for advice.

Improving the scientific literacy of our politicians and Ministers would improve the quality of their decision-making as they would learn both the importance of science and engineering to their role and how better to evaluate scientific evidence. Wider engagement with science and engineering is hampered by an inability accurately to assess risk.

SCIENTISTS UNEASY ABOUT SCIENTISTS

Recent revelations about evidence on the rate of melting of glaciers and potentially damaging emails about global warming and the exposure of Andrew Wakefield's fragile research which caused the damaging MMR scare are giving scientists a bad name. This is irritating for both scientists as a whole, and politicians who have to make or justify decisions based on scientific advice.

Thomas Kuhn pointed out that Scientists can never divorce their subjective perspective from their work; thus, our comprehension of science can never rely on full "objectivity" – we must account for subjective perspectives as well.

Two researchers – Robin Lovell-Badge, who spoke in a personal capacity, and Austin Smith, from the University of Cambridge – told the BBC recently that sometimes scientists might write negative reviews of the work or request additional and unnecessary experiments in an effort to get their own papers, and those of their friends, published sooner.

In an open letter to the editors of major scientific journals published last year, a group of 14 researchers, including Smith, argue that "papers that are scientifically flawed or comprise only modest technical increments often attract undue profile. At the same time publication of truly original findings may be delayed or rejected." To prevent this sort of abuse, they say, reviews, response to reviews, and associated editorial correspondence should be published as supplementary materials with the paper. "If we could just have the rigour of traditional peer review with the ease of publication of the web then all our problems would be solved".

Richard Horton, editor of the British medical journal *The Lancet*, has said that "The mistake, of course, is to have thought that peer review was any more than a crude means of discovering the acceptability – not the validity – of a new finding. Editors and scientists alike insist on the pivotal importance of peer review. We portray peer review to the public as a quasi-sacred process that helps to make science our most objective truth teller. But we know that the system of peer review is biased, unjust, unaccountable, incomplete, easily fixed, often insulting, usually ignorant, occasionally foolish, and frequently wrong."

This terminology has recently been more often applied to politicians…

. . . Today, scientific advice to underpin policy is more important than ever before. . .

CONCLUSION

The debate between scientists and between scientists and politicians is becoming more crucial and open. Rather than taking cover, we should engage. The outcome is too important to leave to chance or swings in public mood.

SO WAS ALBERT EINSTEIN RIGHT?

"Yes, we have to divide up our time…between our politics and our equations. But to me our equations are far more important, for politics are only a matter of present concern. A mathematical equation stands forever."

The risk is that political decisions can have a lengthy impact – for good or ill.

. . . The outcome is too important to leave to chance or swings in public mood. . .

Footnote:

SCIENTIFIC ADVICE QUESTION TO THE PRIME MINISTER

Ian Taylor (Esher & Walton): "As a former Science Minister myself, I am well aware that scientific advice can be politically inconvenient, but will the Prime Minister reassure the scientific community that when disagreements happen, he will engage in rational debate rather than shoot the messenger?"

Gordon Brown (Prime Minister): "Scientific advice is valued by the Government in every area. On climate change, on foot and mouth, on dealing with swine flu and on nuclear matters as well as on drugs, we have very good scientists who have been advising us. From the drugs advisory committee, we accepted all but three of more than 30 recommendations. The issue was not the ability of the committee to give advice or the expertise of the members, it was that once Ministers have had to decide a position, after listening to advice on a wider range of social issues than simply the scientific advice, it does not make sense to send out mixed messages to the whole community about drugs. That is why the Home Secretary made his decision."

Ref: Hansard source (Citation: HC Deb, 4 November 2009, c858)

SCIENCE AND THE NEW PARLIAMENT

Mr Speaker Bercow opened Links Day in June 2009 two days after his own election to the Speakership

The New Parliament Faces Major New Challenges

The great global issues of our time – climate change, food security, water, energy and health – are all interconnected.

You cannot tackle one in isolation from the other.

Every single Member of the new Parliament – whether newly-elected or newly re-elected – will be involved in one way or another in these issues.

Science, engineering and technology [SET] are at the heart of many of the scientific challenges which this new Parliament now faces – and SET underpins many of the solutions.

AND WHAT ARE THESE CHALLENGES?

The Royal Society of Chemistry [RSC] has identified seven areas where science – and the chemical sciences in particular – can make a real difference. Science is not just the way forward out of the recession. It is the key to new challenges such as:

- Energy
- Food
- Future Cities
- Human Health
- Lifestyle & Recreation
- Raw Material & Feedstocks
- Water & Air

WHAT WILL THIS MEAN IN PRACTICE?

ENERGY

Creating and securing environmentally sustainable energy supplies, and improving efficiency of power generation, transmission and use.

FOOD

Creating and securing a safe, environmentally friendly, diverse and affordable food supply.

FUTURE CITIES

Developing and adapting cities to meet the emergent needs of its citizens.

HUMAN HEALTH

Improving and maintaining accessible health, including disease prevention.

LIFESTYLE & RECREATION

Providing a sustainable route for people to live richer and more varied lives.

WATER & AIR

Ensuring the sustainable management of water and air quality, and addressing the societal impact on water resources (quality and availability).

HOW CAN WE DELIVER CHANGE?

These big global challenges can only be addressed if we provide an excellent, diverse and well maintained science base, a good supply of well trained individuals and an innovative climate from which good ideas can be exploited and flourish.

A diverse, highly skilled and technically innovative workforce is fundamental to developing and applying new technologies.

This begins in schools where young children are first given the opportunity to experience the excitement of science and this should be nurtured through their entire education experience.

Raising students' interest and curiosity in the sciences will hopefully stimulate their interest in pursuing a career in science or engineering.

As well as education institutions, industry has a vital role to play in the continuing development of the workforce. Investment in one-the-job training and lifelong learning will help to develop the skills required to adapt to technological advances and ensure that the sciences remain competitive.

We cannot afford a skills shortage, which could leave the next generation ill-equipped to tackle major scientific and technological challenges.

THE ROLE OF THE NEW PARLIAMENT

The composition of the new Parliament is very different from the old. Its way of working may well be different. But Parliament's central role should be as important as ever.

The role of MPs in this new Parliament is vital – and it is up to them to ensure that they now have access to the best possible scientific advice.

That is why this Parliament will need a strong Select Committee on Science and Technology – in *both* Houses.

> . . .We cannot afford a skills shortage, which could leave the next generation ill-equipped to tackle major scientific and technological challenges. . .

And there are now real opportunities for newly-elected MPs to take a leading role in debating science issues of all kinds.

For its part the scientific and engineering community will work together – building links with *all* MPs – to provide Parliament with the best possible scientific advice. The RSC is here to help

A MANIFESTO FOR PHYSICS

Dr Robert Kirby-Harris
Chief Executive,
Institute of Physics

The value of specialist teaching is recognised in most school subject areas. But, as a quarter of 11-16 schools in England have no specialist physics teacher, pupils are expected somehow to receive a thorough grounding in the most fundamental of the sciences without instruction by someone with real expertise in the subject.

The drastic shortfall in the number of specialist physics teachers is well documented. Since one of the factors in subject choice is quality and enthusiasm of teaching, without excellent, specialist teachers it becomes less likely that schoolchildren will go on to study physics at A level and beyond. Entries for A-level physics, which have fallen by 40% since 1980, are now increasing slowly, but we need to do more. There are still shortfalls in the numbers of UK physicists and other scientists and engineers, which will hinder the development of the economy unless remedied.

Having fewer physicists limits the UK's ability to develop innovative technology such as lasers or liquid crystal displays, and life-saving medical equipment such as MRI scanners or methods for the detection and treatment of cancer. Physics provides a fundamental understanding of the world we live in and is at the heart of our society, and physics-based innovation will be crucial in meeting challenges such as global security and climate change.

Creating a skilled workforce begins in school – any other mechanisms to improve UK physics are bound to fail if there are not enough physicists to recruit. Access to high-quality physics teaching for every child is one of three key goals set out in the Institute of Physics's *Manifesto for Physics*, a recently published document that makes the case for investment in science and technology in general and physics in particular.

To remedy the deficit of physics teachers, and to improve physics education generally, IOP's manifesto calls for the creation of incentives for physics graduates to enter teaching; GCSE-level teaching that distinguishes physics as a separate subject; and training and information for careers advisers to ensure that they are knowledgeable about the career opportunities opened up by studying physics. The full range of measures set out in the manifesto is available on the IOP website at www.iop.org/manifesto.

WORLD-CLASS RESEARCH

The second goal set out in the IOP manifesto is funding for science that will keep the UK at the forefront of research. UK science has benefited from growth in public funding for research over the past 10 years, and the UK is among the top four countries in the world for research output in many sciences, including physics. Physics underpins many other sciences, and breakthroughs in physics often lead to advances in other fields from healthcare to information technology, which has been revolutionised by physics.

But this cannot be taken for granted, and funding must continue to grow higher to guarantee a knowledge-led

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. . . Investing in physics is vital to create a future economy that is robust, diversified and knowledge-led. . .

economy and to attract inward investment. IOP recognises that the coming years will see real pressure on government expenditure, but an additional investment of £1bn over the period of the next spending review would allow the UK's scientists to remain internationally competitive at a time when other countries, notably the US and Japan, have increased funding as part of stimulus packages.

Other measures to protect science funding include assurances that the UK will continue to play a full part in international research facilities such as CERN and the European Southern Observatory, with responsibility for currency management transferred to the Treasury; and support for postgraduates and early-career researchers to maintain the national skills base. The manifesto also notes that hosting a major international facility in the UK would bring a range of benefits both economically and scientifically.

HIGH-TECH BUSINESS

The third goal is the creation of a fiscal and regulatory environment that fosters science-based innovation. Physics provides the basis for high-tech industry and jobs, and these sectors – including areas such as the electronics and photonics industries – contribute as much to the UK economy as do finance or construction, and employ more than a million people. Some 48% of all manufacturing jobs depend on physics, and these high-tech areas have weathered the recent recession better than the rest of the sector.

Physics-based innovation is also a fertile area for new business start-ups. Yet many growing companies have relocated outside of the UK to take advantage of preferential tax and grant regimes. A particularly notable example is the case of Plastic Logic, the University of Cambridge spin-out that moved its manufacturing capacity to Germany in 2007. IOP believes that the UK should provide all the support it can to retain the benefits of innovation and to create new billion-pound, high-tech businesses.

The manifesto recommends, among other measures, provision of long-term investment in start-ups through a large-scale, science-focused venture-capital fund; an expanded R&D tax credit scheme to keep the UK ahead of European competitors; and a more creative approach to public-sector procurement, such as directing a fixed proportion of public expenditure to foster science businesses and support innovation.

IOP'S ROLE

In return for support from an incoming government for these goals, IOP has pledged to do all that it can to promote their successful achievement, by supporting education, science and innovation through its activities, publications, and promotional work as well as its advice to policymakers. To contribute towards these aims, IOP will expand its activities with teachers and pupils through workshops, continuous professional development and online support; assist the research community through publications, subject-group activities and conferences; and create new networks to bring together businesspeople and academics.

Investing in physics is vital to create a future economy that is robust, diversified and knowledge-led. IOP's challenge to members of the next Parliament is that if they do nothing else for UK science, they should support the three basic aims set out in the manifesto. Government support for these aims would represent a sound investment to create the skilled workforce, knowledge base and enterprise culture that will ensure a prosperous future for the UK.

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THE INFRASTRUCTURE PLANNING COMMISSION

Sir Michael Pitt
Chair of the IPC

It is widely acknowledged that the previous arrangements for examining major infrastructure projects resulted in unacceptable delays and costs and did not consistently give the right quality of opportunities for all parties to participate effectively in the decision making process. Applicants for major infrastructure projects needed to obtain multiple consents under different regimes for one project. In some cases, lack of clarity over national policy and need for infrastructure led to these issues being debated at great length and expense at individual public enquiries, before the Secretary of State could grant or refuse consent for a project.

Created under the Planning Act 2008, The Infrastructure Planning Commission (IPC) was set up to streamline decision-making on applications for nationally significant infrastructure in England and Wales. The change is a long overdue shake-up of the planning regime for national infrastructure.

It marks the separation of policy-making from decision-making for the first time in planning history, ensuring that applications, for projects such as new wind farms and power stations, will be considered by an independent body.

The IPC opened for business on 1st October 2009 and received the green light from the Rt Hon John Healey MP, Minister for Housing and Planning, to start receiving applications on 1st March 2010.

To be decided by the IPC, projects must reach the thresholds laid out in the Planning Act 2008. For example, if an onshore wind farm produces more than 50 megawatts of electricity. However, smaller infrastructure applications can also be handled by the IPC if the Secretary of State feels that this is necessary.

It expects the first applications it receives to be from energy and transport infrastructure applicants. Indeed, over three quarters of its initial work programme is currently anticipated to be coming from the energy generation sector.

You can view the full Programme of Projects at: www.independent.gov.uk/infrastructure

The introduction of the IPC has left the balance between national and local decisions on major infrastructure projects largely unchanged. In practice, all the projects that are dealt with by the IPC were those previously handled by central government. Some current consent regimes require this, for example because infrastructure projects such as electricity lines, railways are linear and cut across many local authority areas.

In this new regime, all local authorities with an interest will be meaningfully consulted and, by law, local impacts must be balanced against national benefits. Local authorities have a role that is woven into the system at all stages.

The public must also have its say. Applicants must carry out extensive public consultation before they make their application to the IPC. Engagement with the local community and a range of other bodies at the pre-application stage is a very important stage of the new system. Further consultation takes place following submission of the scheme to the IPC.

This new system is designed to ensure that applications are prepared to a high standard. They must demonstrate that they have taken into account responses from consultation. IPC Commissioners' decision to refuse or accept any applications will be determined by evidence

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of public consultation and environmental impact assessments.

Once an application has been accepted as valid by the IPC, the applicant must publicise this and the public will have a further opportunity to express their views in writing and personally to the IPC. The IPC will make all representations public and allow interested parties to comment on them.

Applications will be decided by the IPC within the framework of National Policy Statements (NPSs) which have been widely welcomed. The statements are a cornerstone of the new regime and will be vital to realising significant benefits from the new system.

National Policy Statements are prepared by the relevant government department, not by the IPC, which has no role in policy making. With the national policy debated and set out through the NPS, the Commission's independent consideration of an application for a particular infrastructure project can focus issues specific to that application such as its impact locally rather than wider matters. This allows policy making and decision taking to be kept separate.

The first of these statements for energy and ports completed public consultation in February this year. These are now undergoing parliamentary scrutiny. Once this is completed, Government will take account of the responses and the views of Parliament before designating the NPSs.

If the relevant NPS (or NPSs) is in place, the IPC will make the decision on an application. If it is not, it will make a recommendation to the Secretary of State, who will make the decision.

. . . The new process brings eight former consent regimes into one and will reduce the time taken to make a decision from an average of 100 weeks previously, to less than a year. . .

The IPC will deliver a faster, fairer and more efficient process, to achieve estimated savings of £300 million annually. The new process brings eight former consent regimes into one and will reduce the time taken to make a decision from an average of 100 weeks previously, to less than a year.

IPC Commissioners, appointed for their expertise, will consider applications and make the decisions in the interests of the public and in accordance with government policy. However, the IPC is not a rubber stamp for government, and Commissioners will weigh the national benefit of each proposal against the local impact.

The new process provides greater predictability for investors, ensuring improved opportunities for local community involvement from the outset. Heavy frontloading under the new regime means that applicants will need to demonstrate that they have consulted local people on their proposals and acted upon their feedback, prior to submitting an application to the IPC.

Once an application is received by the IPC, it will have up to 28 days to accept or reject it. Applications will not be accepted if the quality of the consultation undertaken by the applicant is deemed to be inadequate. Involving local people and the local authority at an early stage will also help to ensure that the best possible proposal is put forward.

If an application is accepted, the public will be able to register at the appropriate time to provide their views in writing to the IPC, and later to participate in open floor hearings and to cross examine evidence.

The IPC is independent, impartial and inclusive and it operates independently from Government. All Commissioners are screened and allocated to projects to ensure they have no conflicts of interest and the IPC is accountable to Parliament and to the courts for its decisions. It is a completely open organisation and does not have confidential conversations. For this reason, it also publishes on its website a record of the advice it has provided about the new process.

At every step, the IPC will ensure the new regime achieves its core objective of greater efficiency. However, it is well worth emphasising that this will be achieved through a total commitment to its core values of being independent, impartial and inclusive.

A range of views are already being expressed about the new regime, as will be the case with each project proposal. It is the job of the IPC to ensure that all those views are included and taken on board, as it starts to receive and process applications.

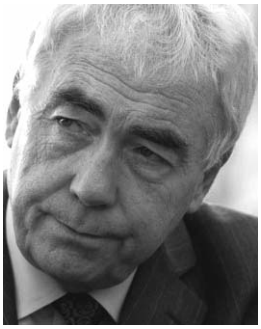
The IPC recognises that developing a proposal for a nationally significant infrastructure project is a major undertaking. It represents a massive investment and a long term commitment on the part of the applicant and investors.

Therefore, it is vital for all with a stake in this process to be clear that there are no short cuts in the new process. Projects will not be fast tracked or applications rubber stamped. Every proposal will follow the same vigorous process.

Investing significant time and effort in working with local people to develop and enhance a proposal from the outset will give it a better chance of success. It cannot be overstated that the pre-application stage is the key stage in the new process to get an application right. Applicants who engage early and meaningfully will be able to submit a stronger proposal to the IPC for consideration.

More information is available by visiting www.independent.gov.uk/infrastructure to view guidance on the new process, frequently asked questions; the programme of projects and record of advice. Contact the helpline, Mondays to Fridays, 8am - 6pm on: 0303 444 5000 or email at: ipcenquiries@infrastructure.gsi.gov.uk

SCIENCE FOR PARLIAMENTARIANS?



Phil Willis
Chair of Science and Technology Select Committee 2005 – 2010.

When asked to comment on what I will miss most about leaving Parliament I always answer without hesitation – 'being a member of the Science and Technology Select Committee'. The past five years as Chair have made me realise the importance of the select committee system for parliamentary scrutiny but equally the crucial role that science plays in government, society and the future of our global existence. Indeed there is virtually no aspect of our lives from medicine to sport, industry to the environment where science and its application are not crucial for success.

The case for science has never been greater and the UK science community has arguably never been stronger yet the support for science in parliament is weak and for most MP's peripheral to their roles both in Westminster and in their constituencies. This apparent dichotomy may result from the fact that few MP's have a science background either academically or industrially but I suspect that that is more of an excuse rather than a reason. Just as two decades ago the scientific community led by the Royal Society launched the hugely successful 'Save British Science' which brought science and policy making together. The 2004 Science and Innovation Framework created a tangible vision for science within government. Recent initiatives at school and university level have seen the prioritisation of science courses for A2 and undergraduate students. *'Science for Parliamentarians'* must now be the campaign challenge as the 2010 intake of MP's take their places on the green benches.

This will not be an easy challenge to overcome. As recent research for the Times showed whilst in the last parliament 86 MP's had a graduate science degree background (13.3%) the new parliament is likely to have no more than 77 (11.8%) with only three PhD scientists, Sarah Wallington, Stella Conway and Julian Huppert joining the ranks. Nor will there be a strong cadre of existing science advocates to greet them. Dr Brian Iddon, Dr Doug Naysmith, Dr Ian Gibson and Dr Des Turner have all retired as Labour MP's and Conservative science champions Ian Taylor and Robert Key have also gone. This means that the Chairmanship and the composition of the new Science and Technology Select Committee will have a greater importance than ever before. The Committee will have a role of not only scrutinising science across government but championing science in the Commons and outside in the broader community.

There is no doubt that the Science and Technology Select Committee under leadership from all three political parties has punched well above its weight in taking on difficult and demanding inquiries. The fact that it is hugely valued by the science community is without question. Where else has one seen a campaign to have a Committee restored after it was lost in the recent ill advised move to create the Department of Universities, Innovation and Skills? It is that legacy which hopefully will prove the spur for the new committee to lead a *'Science for Parliamentarians'* revolution in 2010 and beyond.

The need for a science committee with a broad and innovative remit is not new – indeed that need has been apparent for over 70 years, a period in which science has come to exert a strong influence on many aspects of public life. The first committee was established in the 1930's following a campaign by amongst others HG Wells and the then editor of Nature Sir Richard Gregory. However it was not until 1966 that select committee for science and technology was formed. Active until it was disbanded in 1979 this committee produced some valuable reports including the 1967 report on the *United Kingdom Nuclear Reactor Programme* which Tony Benn the Minister of Technology claimed was "a document of great value".

Between 1979 and 1992 science took a back seat in terms of parliamentary scrutiny and importance – more often

than not being seen as a sub set of education. So much so that the House of Lords moved to create its own Science and Technology Committee though its remit and arguably its influence was inevitably less broad. However after a break of 13 years the modern science and technology select committee re-emerged in 1992 following the creation of the Office for Science and Technology headed by the Chief Scientific Adviser. This new committee quickly made its mark with hugely influential reports on cancer, carbon capture and storage, light pollution and stem cells. It also took on the role of scrutinising the then £1 billion budget spent on research through the Research Councils.

My involvement with the committee began in 2005 after the General Election. After six years leading the Liberal Democrat Front Bench team on Education and Employment I sought to return to the back benches and take up a position on the S &T Committee largely because of my fascination with science rather than any deep knowledge or experience. Overcoming this very obvious hurdle was never going to be easy considering that the previous Chair Dr Ian Gibson was recognised as the Commons leading voice on science and a scientist with a strong track record as an academic at the University of East Anglia. The Committee too had a coterie of scientists who regarded my lack of scientific knowledge as barrier to leading the committee though most including the admirable Dr Brian Iddon (a massive loss the Commons) quickly offered support, advice and explanation on complex language and concepts.

What quickly dawned on me was that this was not a committee simply for scientists to test their skills and knowledge but a vehicle to examine policy and engage a wider audience with science. In fact the very challenge that faces the 2010 committee. It is after all, not the scientists who need persuading of the value of science but the rest of us who are not naturally drawn to its defence.

On a personal basis I set out to meet, understand and engage with the broader scientific community and spent one day each week visiting scientific establishment to discover a world full of the most exciting people, research projects, discoveries and unbelievable ambitions. Whether visiting the Atlas experiment in Cern, the genetics laboratories at the Sanger Institute, the oceanography centre at Southampton or the Centre for Life in Newcastle – I found a world of science, technology and engineering that made my passion for science all the stronger. Of greater importance was the realisation that every single global challenge that we faced would depend on our scientists and engineers working to find solutions.

. . . the true value of science comes from seeking truth . . .

The realisation that the Science and Technology Committee could look at any aspect of the government's involvement with science and prepare a commentary and make recommendations has been truly exhilarating. There was of course never sufficient time to do all the inquiries we wanted to do and indeed the lack of members willing to engage with the work of the committee at times put intolerable burdens on a core of dedicated colleagues. (This is a problem that must be addressed in the future if the Select Committee system is to function effectively). Despite this challenge eight inquiries were completed in the six months prior to parliament being dissolved. Nor was our work without controversy!

The proposal to 'evidence check' whether evidence was being used to underpin government policy was not a new idea – it had been a constant theme for the Committee for five years. We looked at a wide range of government initiatives from swine flu vaccinations to the teaching of "pseudoscience" in our universities but decided to hold short inquiries into *Early Literary Interventions* including dyslexia and *Homeopathy* – concerning the licensing of homeopathic products and NHS funding. Both evidence checks concluded huge flaws in the formulation and justification for government policy and in the case of homeopathy a glaring disregard for any evidence base at all. The fact that the wrath of the homeopathic community descended on the Committee was interesting!

Of course the S&T Committee has never shied away from controversy – our decision in 2006 to continue the work commenced by Ian Gibson on the *Human Reproduction and the Law* led us to challenge Government thinking on the licensing of research on embryos and in particular the use of admixed embryos. The fact that subsequent legislation incorporated many of our recommendations is testimony to the power of the select committee system.

Few Committees have been as influential as the S&T Committee. The 2000 and 2002 Reports on *Cancer Research – a fresh look and Cancer Research – a follow up* were largely responsible for the 2000 NHS Cancer Plan. An inquiry into an obscure 2006 EU directive that would have virtually stopped the use of MRI scanners in the NHS resulted in the Commission postponing and later completely revising its proposals on its electromagnetic field directive. The 2007 Report *Investigating the Oceans* resulted in the government agreeing to the creation of a National Oceanographic Centre to promote and coordinate marine science research. And despite the furore it caused, our 2007 review of the *Scientific Developments Relating to the Abortion Act* allowed us to present an objective analysis of such developments to Parliament that proved invaluable when amendments to change the Abortion Act were tabled later in that year.

It is therefore with a heavy heart I pass on the mantle of Chairman but I earnestly hope that the he or she will continue the quest to search for evidence when examining government policy. After all the true value of science comes from seeking truth – and that all too often makes politicians of all persuasions rather uncomfortable.

DRUGS – FUTURE CHALLENGES TO BRAIN SCIENCE AND LEGISLATION

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INTRODUCTION

The brain is in essence an organ that functions through pharmacological interactions between neurones which makes it very amenable to manipulation by pharmacological agents which we call drugs. So far over 80 neurotransmitter and related substances have been identified in brain which gives many more targets for drug treatments than we currently have available to psychiatry and neurology. Areas of current clinical interest that may provide challenges for future legislation include drugs that enhance brain functions such as cognition and memory and those which give pleasure. Future areas are more speculative but include drugs that have the potential to ameliorate or even reverse the brain dysfunctions that underpin certain neuro-developmental syndromes such as Down''s, Fragile X and Retts syndromes.

THE CURRENT REGULATORY POSITION

Drugs are regulated in a number of ways depending on their perceived benefits, harms and history. Some are controlled by sales regulations. Freely available drugs that are simply taxed include tea and coffee plus the low-grade stimulant khat which is obtained by chewing fresh plant leaves that are imported from East Africa and charged VAT on arrival. Other legal drugs are regulated by age limits for purchase (solvents and glues) which is also the case for alcohol and tobacco products though these also attract drug-specific taxation and limitation of times and places they may be sold.

Drugs with medical uses are controlled under the Medicines Act which can punish the sale outside of approved medical indications, whereas drugs used for recreational purposes are controlled under the Misuse of Drugs Act 1971 (MDAct). In practice many drugs fall under both Acts as many of the drugs in the MDAct are also medicines. These include opioids [eg heroin] stimulants [amphetamines] benzodiazepines, ketamine, GHB and anabolic steroids.

The decision to regulate drugs under the MDAct is made by Government in consultation with the Advisory Council on the Misuse of Drugs (ACMD) a statutory body whose role is to consider relative drug harms and advise government on how to deal with them. Drugs considered sufficiently harmful to be controlled under this act are then put into one of three classes – A B C – with the most harmful being class A. The maximal penalties for possession and supply are then scaled according to the class.

The current MDAct has a number of major anomalies that have repeatedly been identified by scientists and government committees. These include the seeming arbitrary exclusion from the act of very harmful drugs such as alcohol and tobacco products and the mismatch of class to real harm in the cases of the mushrooms, MDMA [ecstasy] and psychedelics; all of which are clearly less harmful than the other class A drugs they sit alongside and would seem better placed in B or C if in the Act at all – note mushrooms were not added until 2005.

CURRENT ISSUES

Two areas of current concern re new drugs are those relating to cognition enhancers and the so called "legal highs".

Cognition enhancers are drugs that improve brain functions such as memory alertness and attention so may be used to enhance performance in some situations. Such drugs may already be known – eg the amphetamine stimulants – which have been used for over half a century to promote wakefulness in the face of limited sleep, but newer ones for vigilance enhancement such as modfinil (Provigil) are currently available. Others, eg the ampakines, are in development. These drugs often have medical roles and Modafinil is a licensed medication for conditions of excessive sleepiness such as narcolepsy and day-time fatigue. However, concern has been raised because they are being used by students to improve their ability to study and take exams (this is not new, stimulants such as methylphenidate (Ritalin) have been used like this since the 1950s). So should the possession or sale of modafinil for non-medical purposes be made illegal? We shall come back to this issue below.

Legal highs are currently legally-available drugs that are

used recreationally – usually by young people – to change their mind states. They come in various forms; some such as GHB/GBL are sedatives like alcohol, whereas others such as "spice" are variants on cannabis and others, eg benzylpiperazine (BZP), are stimulants. The link between them is that their use is outside the MDAct ie legal until/if the Government controls them. Many are imported, usually from India or China, and ordered by users over the internet. Their harms are not easily determined especially when use is just beginning and there is always the concern that they may be toxic. Based on the best evidence it had in 2009 the ACMD recommended all these three classes of legal highs be controlled and this has now passed into legislation. However the story doesn't end there; possibly in anticipation of the control of BZP new stimulant drugs of the cathinone variety (colloquially called plant food, bubbles or miaow miaow) became popular in the middle of 2009 and now are widely used by clubbers. Should they now be controlled under the MDAct? If they were it seems very likely that other new chemical variants would then emerge from the same chemical factories.

The threshold for entry into the MDAct has never been formally defined. Drugs are placed in the Act based on the basis of evidence taken by the ACMD that they pose significant harms to individuals or society with the assumption (hope?) that legal controls will limit use. For some drugs, eg modafinil, there is good evidence that they are safe – as they have been extensively used in clinical practice and elsewhere with little evidence of harms. For other drugs, eg new legal highs such as the cathinones, there is virtually no evidence of what their effects are in humans other than from self-reports by users who cannot know what they are taking.

The key policy question now is whether a drug or drug class should be controlled if it is not harmful, indeed modafinil may even be beneficial, or before harm has been established? One way out of the cognition enhancer conundrum is to regulate use in other ways – eg universities could insist that students were not allowed to use performance enhancing drugs in exams in a way analogous to the banning of drug that enhance physical performance by sporting regulators. For newer drugs that are purely recreational a proven approach is to create a "holding category" – the so-called class D into which drugs may be put pending determination of their use and harms. This concept is used in various countries but was best formulated in New Zealand for BZP. Here sale was allowed of defined amounts of the pure drug (producers had to comply with good manufacturing practice) to people over the age of 18. Health warnings were issued and the industry worked together to self-regulate production and sales. Using this approach the amounts of BZP sold became clear so that the harms could then be much better assessed in relation to the use of the drug. A similar approach could easily be applied here for these newer stimulant drugs so at the very least we would have a good denominator of use against which to assess harms. Moreover, quality control could reduce the harms from contaminants and other products that might be mixed in, and educational messages could be clearly displayed and accessed.

FUTURE ISSUES

There are two areas I want to focus on. The first relates to the exclusion of alcohol from control under the MDAct. This is an historic anomaly or omission rather than a legal exclusion. It has long been felt by the ACMD that there would be no point in taking a stance to move alcohol into the Act since no government would countenance such a radical change. However, as alcohol is such a damaging drug, then another approach would be to find a safer alternative intoxicant, ideally one that did not cause dependence or addiction and one which could be reversed by an antidote or antagonist. Such drugs may exist, and indeed some of the newer benzodiazepines fall into this category. So could they be sold instead of alcohol? This is not yet known and will not be until such an alcohol alternative enters the market place. The main reason this approach has not been developed already is the concern that such a new drug would likely be subject to legal challenge either under the MDAct or Medicines Act. If government were to give its support for this health-improving approach by making it explicit that this is a desirable goal then we could move forward much more rapidly as major pharma or drinks industries would then be likely to put their immense resources into action.

Finally, there is the new challenge that molecular neuroscience will bring to areas such as learning disabilities (mental handicap). One of the most remarkable developments in the past few years is the discovery that in mouse models of human neuro-developmental disorders such as Retts and Fragile-X syndrome it is possible to reverse the brain abnormalities later in life by targeting certain gene effects. This offers a remarkable opportunity to human developmental doctors to translate these preclinical-clinical findings into clinical treatments. One area of immediate opportunity is in Down's syndrome where it has just been shown that in a mouse model of the disorder memory function can be significantly improved using drugs that were developed (so far unsuccessfully) to treat memory loss in Alzheimer's disease. Clinical trials in humans with Down's syndrome are now required but these pose significant ethical and health policy challenges – eg who should give informed consent (the parent/guardian of the patient) and at what age to initiate treatment? Such issues may require a new approach to drug regulation that borrows from new committees such as those regulating stem cell treatments.

Further reading

EMCDDA monograph 2009. Addiction neurobiology: ethical and social implications

http://www.emcdda.europa.eu/publications/monographs/neurobiology: ISBN 978–92–9168–347–5 doi: 10.2810/48676

Nutt, D. 2006. Alcohol Alternatives: A Goal for Psychopharmacology? Journal of Psychopharmacology, 20: 318-320

Nutt DJ, Robbins TW, Stimson,GV Ince M and Jackson.A (2006) Drugs and the Future: Brain Science, Addiction and Society. Elsevier. ISBN 0-12-370624-6

Williams T and Nutt DJ 2005 – Khat (qat): assessment of risk to the individual and communities in the UK – Home Office on-line publication http://drugs.homeoffice.gov.uk

WHAT ARE THE PROBABLE SOCIAL IMPACTS OF THE LATEST BRAIN RESEARCH?

SOCIAL CHALLENGES FROM NEUROSCIENCE

Professor Colin Blakemore
Universities of Oxford and Warwick
Neuroscience Research Partnership, Singapore

The presentation, available on the website as a PDF, presents technologies for observing and manipulating human brain function, which is advancing rapidly using structural imaging [CT, MRI, DTI], functional neuroimaging [PET, fMRI, EEG, ERP, MEG], and transcranial magnetic/DC stimulation. Knowledge of molecular mechanisms is leading to new drugs. Brain structure and function are revealed with the help of these technologies which enable the following; eavesdropping on the mind, controlling and extending brain function, and challenging the concept of responsibility. This creates several ethical dilemmas related to social inequalities in access to brain enhancement, personal freedom to use brain modification, behavioural manipulation in children and criminals, the use of mind probing by commercial organisations, such as the police and the military, and modification of the concept of guilt.

WHAT ARE THE PROBABLE SOCIAL IMPACTS OF THE LATEST BRAIN RESEARCH?

ADMISSIBILITY OF LIE DETECTOR TESTS

Rudi Fortson
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presented by David Ormerod
Barrister (Middle Temple) and Professor of Criminal Justice, Queen Mary, University of London

SUMMARY

In England and Wales evidence of the results of a polygraph test (or other existing lie detection processes – eg truth drugs) is not generally admissible at trial. In *Bernal and Others v The Queen (Jamaica)* [1997] UKPC 18, their Lordships did not find it necessary to express any final conclusion as to whether or not there may be *"exceptional cases where the evidence of an expert may be admissible to testify as to the results of a polygraph test. The arguments against the admission of such evidence are very formidable."*

OBJECTIONS TO ADMISSIBILITY

There are at least seven reasons why lie detection tests have not been received by the criminal courts.

1) The principle of orality: *"Pervasive orality"* and the *"principle of testament* by identified witnesses" are integral components of the English criminal trial.[1] Traditionally, disputed evidence will be received orally from the witness, who will be examined and cross-examined in open court before fact-finders who may have regard to the witness's demeanour. Lie detection examinations of witnesses take place out of court; the questioning is controlled by the forensic examiner and not by the court or by the advocates.

2) Encroaching upon, or usurping, the function of fact-finders. The focus of the polygraph examination *is on its results* and the conclusions of the *examiner*, rather than on the conclusions to be drawn from the *content* of the witness' answers having regard to his/her demeanour. To that extent, the examination encroaches upon the ordinary trial process. Even if the polygraph examination was video recorded, that would not fully meet this objection, or resolve other issues, such as the weight to be given to the test results (even assuming that they had probative value) or a perceived danger that jurors might be unduly persuaded by the results of an examination that is styled "scientific."[2]

3) Rule against narrative; self-serving consistent statements: Although now subject to many exceptions, the usual rule is that a witness's previous consistent out-of-court statement is inadmissible to bolster his/her oral testimony. Self-serving statements are easily manufactured, and "pervasive

orality" and "oral testimony" are integral components of the English criminal trial. A lie detection test result that suggests that the witness has told the truth, would offend these principles. It would have the effect (arguably) that an accused would be able *"to elect not to deny his crime under oath and to substitute for his own evidence the results of a test administered by a mechanical device." (Phillion v R.,* [1978] 1 S.C.R. 18). [3]

Where a witness blurts out that he/she is telling the truth, and has undergone a polygraph test to prove it, the jury can be told to disregard the remark: *Chapman* [2006] EWCA Crim 2545.

4) Third party *character evidence* bolstering the witness' evidence: evidence given by the polygraph examiner that the witness 'passed' the test, might be treated by fact-finders as evidence of the witness' good character. The reality might be very different, for example, where the witness has criminal convictions. A witness who has passed the test on more than one issue might be treated as having a propensity to be truthful when, in fact, (the witness?) W has convictions for offences of dishonesty (perhaps following a trial having given evidence that was rejected).

5) Unwarranted adverse inferences by not taking the test: If lie detection tests were admissible, there is a risk that a jury might draw adverse inference against suspects who declined to submit to a test. This argument influenced the European Commission on Human Rights in *A v Germany* (1984) 6 E.H.R.R. CD 360. The Commission considered it justified that *"no general right for the use of a lie detector is granted to suspected persons, or to convicted persons":*

"The authorisation of some persons to use a lie detector would inevitably influence the position of other persons who would refuse to be subjected to the lie detector. Their refusal might be interpreted as a sign of guilt."

6) When is a fact true or false? The questioning of a person in the course of a lie detector test will not replicate the close forensic examination at trial by advocates who are expert in the law. Some facts can be established by way of a "yes" or "no" answer to a carefully framed question. However, many facts do not have a straightforward structure, and an accurate test result may depend on the witness' ability to understand concepts that are integral to the trial. For example, consider the question: "Did you steal the car?" As a matter of law, theft is not to be equated with merely taking somebody else's property. The element of "dishonesty" is an important element of the offence. But, a *dishonest* person might *truthfully* answer that he did not regard his actions as dishonest. Many persons confuse a "lie" with being "mistaken". This is not an isolated example.

7) The test is reputedly unreliable. The polygraph test has not received a favourable press in terms of proof of reliability. This has probably been the greatest stumbling block to its reception in a criminal trial. The widely held perception is that that lie detection tests are unreliable, so that a nervous but truthful witness may be said to have told "untruths", whereas an habitual liar can out-smart the test and have his credibility bolstered in consequence.

CURRENT RELIANCE ON POLYGRAPHS IN THE CRIMINAL JUSTICE SYSTEM

Under ss. 28 to 30 of the Offender Management Act 2007 the Secretary of State may include a polygraph condition in the licence of a person (1) *serving a relevant custodial sentence*; (2) in respect of a *relevant sexual offence* (eg rape) if released on licence by the Secretary of State; and (3) he is not aged under 18 on the day on which he is released. A "polygraph condition" is a condition which requires the released person to participate in polygraph sessions conducted with a view to monitoring his compliance with his licence or improving the way in which he is managed during his release on licence. Mandatory polygraph tests are being piloted in limited areas until 31st March 2012.[4] *The Prison Service Instruction 04/2009* (as at 9th March 2009),[5] advises that the polygraph condition should be worded in these terms:

"To comply with any instruction given by your supervising officer requiring you to attend for a polygraph session, to participate in polygraph sessions and examinations as instructed by or under the authority of your supervising officer, and to comply with any instruction given to you during a polygraph session by the person conducting the polygraph session."

The offender is required to participate in polygraph sessions at specified times and to comply with instructions of the "polygraph operator." The Secretary of State has issued *A guide for offender managers ("Mandatory Polygraphy for Sex Offenders Pilots")* which the polygraph officer must have regard to. The guide sets out matters that constitute a "pass" or a "fail" and recognises that tests can be inconclusive. Importantly, the guide also emphasises that the result of a polygraph test (either a pass or fail) cannot, in isolation, be used as a basis for decisions – such as whether to recall to prison. In addition, the guide regulates the process where an offender discloses information which was previously unknown. Any disclosure by the offender of risky behaviour should be dealt with through a variety of means, such as supervision, or, in cases where the potential for a further crime is indicated, through report to the police. Section 30 of the 2007 Act also provides an important safeguard: no use can be made in any trial of statements made or psychological reactions of the released person while participating in a polygraph session.

In *Corbett v National Offender Management Service* [2009] EWHC 2671 (Admin), the Court rejected an argument that imposing a polygraph condition breached an offender's right to respect for private life under Article 8 of the ECHR.

THE FUTURE

Although the Privy Council in *Bernal v The Queen (Jamaica)* left open the possibility that there may be exceptional cases where the evidence of an expert may be admissible to testify as to the results of a polygraph test, it is unlikely that, WITHOUT a proven record of reliability, the courts will be ready to receive evidence of lie/truth detection results. Even if reliability were to be established, other objections to the adduction of such evidence at trial would remain.

However, if the results of the pilot under the Offender Management Act demonstrate that these methods are reliable indicators of a risk of re-offending, it is possible that they will be used to assist the court *at the stage of sentencing* where the judge has to assess dangerousness and whether the risk of reoffending merits the imposition of particular orders.

Arguably, different considerations apply where a case is tried by judge alone rather than by juries (but would there then have to be different rules in respect of criminal cases that can be tried with and/or without a jury?).

1 Per Buxton LJ, *R. v Derodra* [2000] 1 Cr. App. R. 41.

2 Neal Feigensona1, *Brain imaging and courtroom evidence: on the admissibility and persuasiveness of fMRI*, International Journal of Law in Context (2006), 2: 233-255 Cambridge University Press.

3 Supreme Court of Canada.

4 See the *Offender Management Act 2007 (Commencement No 3)* Order 2009 (SI 2009/32) which brought into force the relevant provisions of the Act for a period beginning on 19th January 2009 and ending of 31st March 2012.

5 *Polygraph Rules* have been made under the 2007 Act (see SI 2009/619) and these came into force on 8th April 2009.

BRAIN SCIENCE: IN THE REGULATORY SPOTLIGHT

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One by one, emerging technologies move into the regulatory spotlight. Sometimes, the questions, as with nanotechnologies and synthetic biology, are about safety, about risk and benefits, about precaution and regulatory prudence. Sometimes, the questions, as with red biotechnologies, are about regulatory legitimacy – not so much about acceptable risk but purely and simply (although with much disagreement) about acceptability. Sometimes, the questions, as with the control of on-line suppliers of goods and services, are to do with regulatory effectiveness. And, in almost all cases, there are questions about maintaining an adequate connection between the law and these rapidly developing technologies. Now, it is the turn of brain science together with the new generation scanning technologies to move into the spotlight – most recently, with the results published by Adrian Owen's team (raising the prospect of checking the status of persons who are in a vegetative state and, possibly, of communicating with locked-in agents). What should regulators make of these technologies?

By and large, scanning technologies do not seem to give rise to special questions of safety; and, while there are many questions about the privacy and confidentiality of the information obtained by a scan, legitimacy concerns will probably be assuaged by ensuring that those who are scanned do so on the basis of a free and informed consent – or, where scans are not authorised by consent, that the justifying reasons have more weight than the public interest in respecting privacy and confidentiality. Whether or not brain-based technologies will be sufficiently reliable to make an effective contribution to various kinds of non-clinical assessment (for example, to assessments made by employers or insurers, or in courtrooms) will also be an issue; and there will be connection questions if, say, scanning devices become smaller, cheaper, and more widely distributed as has been the case with computers. At the top of our agenda, however, I suggest that we should consider the regulatory implications of scanning technologies in a context of much more intensive surveillance coupled with a tendency towards profiling and prevention.

The law, whether made in Brussels or at Westminster, regulates human conduct in a way that carries with it no guarantee of compliance. The signal to regulatees is that they ought or ought not to do such and such a thing. Sometimes, as with the classical criminal law, the message is that the acts that are prohibited are not only legally, but also morally, wrong; the signal to regulatees is that, if they are to do the right thing, then such acts ought not to be done. For some regulatees, the moral signal might not be decisive; but, where the law also signals that there is a sanction for non-compliance, regulatees might be persuaded that, prudentially, it is in their interest to comply. At all events, the law operates with two principal registers: the moral register (appealing to regulatees doing the right thing); and the prudential register (appealing to regulatees acting in a way that, all things considered, is in their own interest). If the former exhortation is to comply because "you know that this is right", the latter is to comply because "you know that this makes sense". With the emergence of modern technologies, technologies with radical regulatory potential, all this is set to change.

The first change involves the use of technologies, such as

CCTV, DNA profiling, and (if recent reports are to be taken seriously) surveillance drones flying at 20,000 feet, to harden both the perception and the actuality that non-compliers are likely to be detected. This is not a revolutionary move because, as I have said, the prudential signal is already an important element in the regulatory repertoire. However, the shift away from the moral signal towards reliance on the prudential signal already marks a society in transition.

The truly revolutionary change occurs when technologies are employed in a way that makes it no longer reasonably practicable or simply impossible to act other than in accordance with the desired regulatory pattern. The regulatory signal is no longer that one ought or ought not to do such and such; now it is that such and such cannot be done. Already, we find ourselves locked out without passwords or trapped in systems (such as transport systems) that are coded in a particular way. When code and design rule, we have no choice; and, in practice, the philosophical agonising about free will is academic – the fact of the matter is that we are moving towards being regulated in a way that treats us as though we cannot act otherwise than we actually do (how we act being determined by the design of the regulatory environment in which we find ourselves).

Technologies that are developed around brain science need to be viewed, not in isolation, but as a part of this larger regulatory picture. If courts admit the evidence of a scan, the traditional role of the jury is likely to be diminished; and, if (as Canadian neurosurgeons have suggested) deep brain stimulation can improve recall, then the evidence of eyewitnesses who have undergone such stimulation might be treated as privileged: the forensic implications are highly significant. Of far greater significance, however, is the prospect of scanners being installed at the entrances to airports, government buildings, theatres, restaurants, and shops with a view to detecting some kind of brain activity that is classified as "risky". If scanners, in conjunction with an array of profiling technologies, routinely sound the alarm or simply deny access to high risk individuals, then (for better or worse) we are in a new regulatory world.

Finally, there is the question put by Colin Blakemore: if the application of these regulating technologies produces a pattern of behaviour that is in line with moral requirements, if the pattern is of people doing the right thing, does it really matter why they do it? To be sure, if humans were morally omniscient, and to the extent that moral requirements were beyond question, we might well reason that it would not matter. Indeed, even absent moral omniscience, we might reason that, where moral requirements are agreed, it does not matter – for example, why should it matter whether traindrivers respect the life and well-being of their passengers by freely choosing to stop when the signals are on red, or whether they stop because the train is designed in such a way that it cannot pass signals that are on red? However, for communities with moral aspirations, the moral development of humans does matter; the much-maligned idea of human dignity is precisely about humans trying to do the right thing in the face of opportunities to do the wrong thing. This is not to say that we should take Samuel Butler's advice, destroying our machines and turning our backs on technology. Far from it; we want to enjoy the benefits of technologies, including scanning technologies; but we also need room for moral debate and development. In the coming decades, for parliamentarians and for the community at large, the Blakemore question is fundamental: how do we create regulatory environments that employ smart technologies to safeguard vital human interests while still cultivating the virtue of human dignity, of doing the right thing for the right reason?

DURING DISCUSSION THE FOLLOWING POINTS WERE RAISED:

Scientific evidence from post epileptic automatism research has important implications for the legal system. An example of a lorry driver was described who had no recollection of a series of serious road accidents, but who was found not guilty in court of all dangerous driving offences when it was subsequently demonstrated from an EEG scan that he suffered from epilepsy. That type of evidence is therefore a perfect defence.

There are many defences and offences in which scientific and medical evidence is critical. Concern arises when scientific evidence is used to determine whether someone is capable of telling the truth and deciding whether scientific evidence is a better judge of that that a jury. The bad news is that some of the other examples given are all treated as insanity. The definition of insanity was established and has not changed in criminal law since 1840. It is the same in Parliament as well! However, the NHS may able to make much greater use of brain scanning techniques in future to support medical treatments for disorders likely to result in antisocial behaviour, and thereby putting lawyers out of business in 100 years time!

We should accept the fact that people take drugs and people have always taken them as a defining characteristic of hominids. Almost no one has not tried to alter their mental state with something, including tea or coffee. Why we do it is fascinating. As a scientific committee we should accept that and when we do, it should be to the best advantage and the least disadvantage. If Ecstasy is a popular drug, why don't we encourage the pharmaceutical industry to make a safe version of this drug? This is an interesting philosophical position which few people are discussing. It would be reassuring for parents to know that their children are taking drugs which are acceptably safe. There is no reason why society should not accept such a view.

Could courts recommend that antidotes be administered to prevent repetition of certain crimes? This already happens with heroin addicts who have the choice of prison or an antidote.

Cannabis is more dangerous than tobacco due to lung cancer. There are synthetic cannabinoids that relieve pain and nausea and help MS patients. There is now available a purified cannabis leaf administered by adsorption through a mucous membrane and not through smoking.

If brain imaging of lying and the resulting brain pattern can be shown to be definitively reliable there is no reason why it should not overcome the most significant objections in law. It is wrong to assume the technology will never be better. We need to be thinking about it now. Laws regulating drugs are not up to it and are not any use for regulating drugs. We need scientists to challenge political judgements.

DEBATING THE IMPACT OF TECHNOLOGY ON THE BRAIN

The All-Party Parliamentary Group on Scientific Research in Learning and Education was established in 2006 to explore how the ever-increasing body of scientific information on child development and learning can be used to inform education policy and practice. Since its launch, the APPG has held meetings on neuroscience in the classroom and the use of cognitive-enhancing drugs. The group attracts broad cross-party support and the meetings provide a unique opportunity for parliamentarians to meet with scientists, teachers, parents and charities to discuss such topical issues.

The most recent meeting, chaired by Lord Sutherland, focused on the impact of technology, such as computer gaming, on the brain and featured presentations from Baroness Professor Greenfield (Oxford University) and Dr Vaughan Bell (University of Antioquia, Columbia and King's College, London). The meeting began with Greenfield presenting evidence of the brain's unique ability to adapt to whatever it encounters, thus demonstrating its impressive sensitivity to experience. She posited that whilst this quality is essential for an individual's uniqueness it also means that experiences could have a detrimental effect on the brain. She went on to suggest that intense use of technology, such as gaming, may result in an individual returning to the highly sensory world of young children, rather than the sophisticated, cognitive world of the adult; that is to say, a return to experiencing sensations, rather than thoughts. In addition, users may have shorter attention spans and lack an ability to use abstract concepts and meaning. Furthermore, Greenfield suggested that these could lead to reduced empathy and identity and increased recklessness. Greenfield acknowledged that there is some evidence for positive effects of gaming, with some studies showing improved reaction times, for example, but that more research was needed as simple improvements in reaction time would not be outweighed if the capacity to exhibit empathy, for example, was lost. She concluded that we cannot afford to be complacent and we would be doing a disservice to the next generation if we did not ask, and attempt to answer, questions about the potential of technology to harm brain function.

Dr Bell was charged with providing the counter-argument and he gave an excellent overview of existing research, drawing on 1500 scientific articles. He suggested that the high level of media interest was merely history repeating itself: comics, television, records and radio have all been similarly criticized. Much of this criticism is based on two premises: firstly, that technology can be damaging and secondly, that the content is poor. Addressing the first premise, Bell presented data showing that gaming improved reaction time, whilst not altering accuracy or impulsivity. He conceded that there was evidence that those who engage in gaming have slowed academic performance but only when gaming displaced academic work, ie homework. Given the recent concern that violent games increase the incidence of violent behaviour, Bell provided an overview of the relevant research, agreeing that violent games are associated with increased aggressive thoughts and behaviour but that this was due to the content of the game rather than the act of gaming itself. Social networking sites such as Facebook have also received significant attention recently but, despite suggestions that those who rely on such two-dimensional interactions may become less capable of forming other relationships, Bell stated that, in fact, the reverse may be true as research has shown online networking to enhance offline friendships.

At first glance, Greenfield and Bell appeared to present opposing arguments but nevertheless agreed on a number of key points. Firstly, that more research is needed – especially in examining the impact of technology on behaviour more complex than, for example, reaction times – and secondly, that it may well be that such technologies have different effects on different individuals, with those already predisposed to depression or anxiety for example, being more at risk to any detrimental effects. Thirdly, both agreed that playing computer games or watching television in isolation may have very different effects to doing these same activities in a social setting, such as with family or peers. It seems then that it is too early to make any firm conclusions about the impact of technologies on the brain. There do appear to be some positive effects, but the content of the game and its displacement of other activities can lead to detrimental outcomes. What is clear is that we should continue debating and researching such topics to ensure that we, as a society, are aware of these effects, both good and bad.

SCIENCE AND ENGINEERING CHALLENGES IN THE OCEANS AND THEIR RELATION TO MARINE POLICY DEVELOPMENTS

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INTRODUCTION

The oceans cover 72% of the planet's surface. In 2008, ocean activities excluding coastal leisure contributed some 3.9% of UK GDP, most (46%) from the oil and gas sector. Other sectors contribute less: ports (12%), shipping (8%), equipment (7.8%), defence (6.7%), cables (6.4%), and business services (5%). Renewables contributed 0.02%. Leadership in ocean science and engineering in academia and industry comes about through the application of novel leading edge technologies. Developments in technology depend on a combination of current trends and unexpected imports from other technology fields, influenced by policy and regulation.

Forecasting future developments requires an appreciation of context. By 2100, 2 billion more people will have been added to the planet. As populations become affluent they use more energy. By 2020, demand will be 70% above 1997 levels. We are approaching peak oil, and approaching peak gas. The easy oil has been found and exploration has moved into deep water. Operations are more costly, so oil prices are rising. The climate is warming, ice is melting, and the seas are rising. Nations are moving towards low carbon economies, and investing in renewable energy sources. Copenhagen achieved no binding agreements, but industrialised nations are proposing to lessen their use of oil, gas and coal with time. We will still be using oil and gas by 2100, not least to meet the demands of transport. Meanwhile developing countries will be increasing their use of coal, oil and gas. Melting sea ice is opening up the Arctic, where nations are claiming exclusive economic zones. Nations will squabble over the extension of resource-rich continental shelves into deeper Arctic waters.

Technological developments are driven largely by the need to ensure reliability and reduce cost, which often leads to de-manning. In all fields we see trends to growth towards: automation and robotics; lighter weight and stronger materials; improved connectors and cabling; miniaturisation; computerisation; increased use of fibre-optics in communication; numerical modelling of operations and environment; visualisation of processes and operations ahead of deployment; underwater in situ power generation (eg from currents); and high voltage subsea energy supply. In all fields there is more use of satellites for remote sensing, positioning, and communicating with instruments and between instruments and the shore.

The field is subject to both opportunities and threats. Growth in ocean policy leads to growth in regulation, some governed by international agreements. Developing new technologies and markets demands financial incentives. Deployment of those technologies may be stymied by NIMBYism. Ageing North Sea infrastructure must be decommissioned. Small independent operators are entering the North Sea; they lack financial stability in comparison with the majors. The largest threat may come from China, which is massively investing in cheap, green technologies – competition will be fierce. Waste needs to be stopped – especially gas flaring at offshore production platforms worldwide. Difficulties in mitigating the effects of climate change will require geoengineering solutions including Carbon Capture and Storage (CCS), demands for which can be met by subsea storage of CO_2 in empty petroleum reservoirs. Ships may be deployed to spray water droplets above the sea to form clouds over the ocean to reflect sunlight.

OIL AND GAS

The average recovery from North Sea oil reservoirs is 40-50%, and from gas reservoirs 50-60%. The challenge is to raise recovery to 80%+. That requires better techniques for imaging, visualising and monitoring reservoir behaviour. The challenge in deep water is to extend production from water depths of 2500m from surface facilities and 3000m from subsea facilities to recovery from water depths of 4000-4500m, combined with recovery from up to 12,000m below seabed. Drilling costs go up with water depth, so new techniques like seabed drilling and riserless and dual-gradient drilling are required, along with novel methods for casing the drill hole, like continuous reeled casing.

Subsea production requires automated subsea systems for pumping, processing (eg oil-water separation), monitoring, controls, and high-power electrical supply. Future seabed production systems will be connected to processing and export systems and managed from the beach. Advanced remotely-operated underwater vehicles (ROVs) will be used for intervention (doing things) and inspection, with ROVs eventually being replaced by autonomous underwater vehicles (AUVs).

MARINE RENEWABLE ENERGY SOURCES

The Government plans significant growth in offshore renewable energy, mostly from wind near-shore (<25m deep); near-shore winds have higher energy than winds on land. Offshore wind farms have hidden costs; they demand a considerable shipping resource for deployment and maintenance, use vast amounts of steel and concrete, and require lots of maintenance due to corrosion by salt water and salt spray. The potential area of near-shore wind is about the size of Wales. Deep offshore wind (in water 25-50m deep) would double the possible area of wind farms. Shallow water wind farms cost 2x land wind farms; they are affordable because they are subsidized. Deep-water wind farms are not yet economically feasible.

Extracting power from tides and currents is technologically feasible. Although tidal power units can be environmentally contentious, tide pools generating hydro-power used to be widespread on small rivers on the UK coast. Discrete tidal energy units can generate the same power as large wind power units. The down side is that, as in the case of wind, this means that vast areas (or farms) are needed to generate significant power. Happily, the North Sea is a natural tide pool of the right size. It could be fitted with underwater "wind mills" in current streams, like the SeaGen device in Strangford Lough in Northern Ireland. Tidal power can also come from barrages across major estuaries, like the Rance in France. The Severn and the Wash both have possibilities. Tidal power could be cheaper than wind power, as the units would be smaller and exposed to less extreme variability, thus reducing costs for safety and maintenance. Does UK tidal power have a fair shake in comparison with wind?

Waves require wind speeds of >0.5m/sec. The west coast, especially off Scotland, Ireland, and Cornwall, has the greatest potential. Three UK-built Pelamis wave energy collectors have operated off Portugal. Each could deliver an average of 300kW. But they are costly – the steel requirement is 3x that for wind power.

To be successful (and cheap) renewable power plants need reliability and maintainability in harsh environments. They demand appropriate marine construction skills and technologies, and the skills and resources for regular maintenance. One can envisage sharing vessels and maintenance and inspection skills and technologies with the offshore oil and gas industry.

SHIPPING

There is a growing demand for vessels for deep offshore oil and gas (tankers and platforms) and for offshore wind, as well as for increased trade by sea. There are demands for greener, cleaner, more efficient and safer operations, which will become stronger with regulated limitations on gas emissions. This will require improved engine, ship and ship system design, and use of lower carbon fuels and high temperature fuel cells. Increasing vessel traffic will require improved navigation, vessel traffic management, information services, digital charting, and hydrographic surveying. Ports will need to think how to respond to the effects of sea level rise.

DETECTING AND MONITORING CLIMATE CHANGE

The oceans store vast amounts of heat and freshwater, and move them around to control climate. Oceans can be monitored via ocean observing systems comprising national components co-ordinated by UN agencies. These systems comprise satellites, aircraft, ships, underwater gliders, AUVS, in situ techniques (moorings), and coastal systems (tide gauges and radars) feeding data into forecast models. Advances require novel sensors and missions. Novel satellite missions include Gravity from Altimetry, and Swath Altimetry (from the Surface Water and Ocean Topography mission). We also need fast deep AUVs. Continuity is essential in coverage of the ocean's surface by satellites and of the ocean's interior by Argo floats. The Global Ocean Observing System (GOOS) is around 60% complete; the aim is for 100% by 2020. Beneficiary sectors include those on land (eg agriculture; water supply; energy supply), as well as those at sea (fishing; navy; shipping; coastal engineering; ports; search and rescue).

COASTAL OBSERVATIONS

Coastal seas are grossly under-sampled. The present UK coastal seas observing network grew like Topsy; it needs restructuring to meet the complex information needs of today. Numerical models will show agencies how the environment works, and detect where and what observations are needed. There is a pressing need for long-term, full-water-depth, multi-disciplinary observations, supplemented by surface data from instrumented ferries. Developing new ocean observing technologies will capitalise on advances in the fields of medicine; microelectronics; microprocessors; and materials. Smaller, lighter, more advanced sensor packages free of biofouling will underpin application of the new science of operational oceanography.

COASTS

Coastal populations are growing faster than elsewhere, along with a growth in marine leisure. Sea level is rising slowly (3.4mm/yr). The maximum forecast for 2100 is around 2m, which represents 2cm/yr. This is not a tidal wave. It can be dealt with by deployment of barriers and dykes (eg Thames Barrier) and by managed coastal retreat in selected areas. Offshore sand and gravel will continue to be required for coastal construction (housing, defences, beach replenishment). There is an increasing demand for environmental forecasts of pollution, eutrophication (too many nutrients = algae using up oxygen), changing ecosystems and fish stocks, endocrine dysfunction, and harmful algal blooms. Such forecasts require developing technologies in environmental chemistry, ecotoxicology, and biomarkers to identify potential hazards.

SKILLS

Investment in advanced education and training is essential to supply the skills base to support growing offshore activities. A supply of highly skilled offshore engineers,

marine scientists and technicians is imperative for the UK to remain competitive in the rapidly advancing offshore technology arena. A long-term strategy is needed to meet the technological demands of rapid growth in offshore renewables, eg to rapidly ramp up tidal and current energy plants. We can also retrain established engineers, physical scientists and technicians (eg with funding for mature students, plus conversion courses). Incentives are needed to get the right growth in skills supply. Robust co-operation between industry and academia is essential to ensure world-class skills development in the right areas at the right rates. The message about the excitement of offshore applications should be transmitted to schools to interest the coming generation.

A MARINE TECHNOLOGY STRATEGY

Meeting these various challenges calls for a strategic approach: the UK needs centres of excellence in developing marine technologies and in building skills through advanced education and training in offshore engineering and associated marine science and technology. These demands are not covered by the new UK marine science strategy.

INNOVATIVE MARINE ENGINEERING AND SCIENCE – ARE WE SWIMMING OR SINKING?

THE OCEAN SINK FOR MAN-MADE CO_2

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THE GLOBAL CARBON CYCLE

The oceans are a substantial sink for man-made carbon dioxide, and are currently taking up about a quarter of the amount of the gas emitted to the atmosphere by human activities. This mainly comes from fossil fuel burning and cement manufacture (about 85% of the total), with the other approximately 15% coming from man-induced land-use changes (mainly conversion of virgin land to agricultural and other uses). The oceans thus provide a substantial service to us since if they were not taking up the CO_2 much of it would likely stay in the atmosphere and so add to the global warming already occurring. However, the ocean sink at 25% is only one place where the extra CO_2 we are injecting into the atmosphere ends up, with almost 30% of the rest being taken up by land plants and the remainder (about 45%) remaining in the atmosphere leading to the observed CO_2 increase and consequent additional greenhouse heating.

All the percentages given above are best estimates and have various degrees of uncertainty, with the ocean sink one of the better known terms. If we now compare the present values of the various sources and sinks of man-made CO_2 with estimates of what they were (say) a decade ago it is clear that, although emissions have increased, the sinks have risen roughly in proportion. The open question is will this continue into the future? On the emissions side it is up to we humans to decide how much we wish the emissions from fossil fuel consumption and land-use change to increase. But we have essentially no control over the amount the oceans and land biosphere take up into the future; that will be determined by whatever natural and man-induced changes occur. In the case of the oceans such changes could be due to increased stratification due to warming of the surface waters or altered biological uptake of CO_2 by microscopic plankton in the sunlit upper layers.

CARBON DIOXIDE UPTAKE BY THE OCEANS

So do we have any evidence concerning change in the ocean uptake of CO_2 over recent years? Some of my colleagues at University of East Anglia have been working on this problem in two of the main regions where CO_2 uptake occurs – the Southern Ocean around Antarctica and the North Atlantic.

In a paper published by Corinne leQuere and co-workers (Science (2007) 316:1735-1738) atmospheric measurements of CO_2 made in the Southern Ocean from 1981 to 2004 are incorporated into an 'inverse' mathematical model to derive change in the strength of the ocean sink of CO_2 over this period. The results indicate that the sink has indeed changed significantly. The authors attribute this to increase in wind strength (itself a result of human activities) bringing deeper CO_2-rich water to the surface thus reducing the air-sea concentration gradient that drives the oceanic uptake. They also predict that this reduction in the efficiency of the Southern Ocean sink will continue in the future.

The second ocean region that has been studied in this context is the North Atlantic where Andrew Watson and colleagues have been using a more direct (observational) approach to try to ascertain if the ocean CO_2 sink varies from year to year and whether any temporal trend in uptake can be observed. To do this they have co-operated with oceanographers from several European countries to measure concentrations of CO_2 in both air and surface seawater from commercial vessels. From the measurements over the period 2002-2007 the amount of CO_2 uptake can be derived with a much improved spatial and temporal coverage compared to that achieved previously. This has required a huge co-ordinated effort and the development of automated instruments to measure CO_2 without scientists being aboard the commercial ships. The results (Science (2009) 326: 1391-1393) indicate considerable variation

between years in the CO_2 sink for this ocean basin. Because of this and the relative shortness of the record, it is difficult to be sure whether the sink for CO_2 is changing in any systematic way. However, if the more limited data for earlier years back to 1995 are used along with the much more complete record since 2002 then it appears that the sink has decreased by maybe 20% over this period.

Both this result and that from the modelling study of the Southern Ocean sink should be treated with caution since such studies are quite recent and the observational records on which they both rely only cover rather short periods of years during which time only small changes seem likely to have occurred. As we move forward, and assuming continued increases in atmospheric CO_2 as well as concomitant changes in atmospheric and oceanic circulation, larger changes in the marine CO_2 sink seem possible. It is clearly vital that such studies need to be continued and extended to other oceanic areas in order to quantify properly how the oceanic sink for CO_2 may be changing.

GEO-ENGINEERING THE OCEANS

Driven largely by the difficulty the global community is having in agreeing reductions in CO_2 and other greenhouse gases, there is increasing interest in the possibility of large-scale manipulation of the planet (often called geo-engineering) in order to ameliorate the effects of increasing CO_2 on climate. One proposed approach is purposely to increase ocean biological productivity, and hence increase CO_2 uptake, by enriching ocean areas with iron, since for about 25% of the ocean this element appears to be the limiting factor for ocean productivity. To date about a dozen small-scale oceanic experiments have been carried out and they certainly show that by adding minute amounts of iron to the seawater large increases in productivity can be produced. However, what is very uncertain is how much of the extra CO_2 taken up by the plankton actually sinks out of the surface ocean and so gets removed from the air-sea system for a substantial time. Modelling studies indicate that if global scale ocean fertilization with iron was carried out for 100 years then a drawdown of about 30 ppm (less than 10% of current atmospheric concentration) might occur. For the huge effort that would be involved, to say nothing of possible unexpected or undesirable secondary effects, this seems like a very poor return.

OCEAN ACIDIFICATION

One consequence of the uptake of additional CO_2 by the oceans, as a result of rising levels of the gas in the atmosphere due to human activities, is that the oceans, particularly surface waters, are becoming more acidic. This is because when CO_2 dissolves in water it becomes more acidic (soda water) as measured by a drop in its pH. So far surface seawater pHs have dropped by about 0.1 units which indicates a 30% increase in acidity since pre-industrial times. If we continue to put CO_2 into the atmosphere at anything like the present rate then seawater pH could increase by 300% (corresponding to a drop of 0.5 in pH) by the end of the century. An important question then is what effect will these changes have on ocean biology? One thing that seems pretty certain is that any effect will be greatest for those organisms that form their structures of calcium carbonate since this mineral is known to be subject to acidic dissolution. Organisms that use calcium carbonate range from corals to some microscopic plankton. We know little of the detail of how such changes will occur, in part because of the difficulty of conducting what are necessarily short-term experiments in the context of changes that will occur on the decadal to century timescale. The topic of ocean acidification is currently the subject of several research programmes both in the UK and abroad.

IN DISCUSSION THE FOLLOWING POINTS WERE MADE:

Solar energy as a source of electric power is primarily sourced from deserts but not yet from the oceans. The Royal Society assessed geo-engineering in a recent report but it is not known whether it will work, especially as there is always potential for unintended consequences.

Education is important, effort is going into retraining people for work in the marine environment and strategies are required to ensure that the appropriate technologies are developed and the right type of people employed.

Are wind farms economic? How will they be hooked up to the National Grid? Wind farms are not expected to be able produce more than 25% of the UK's total power requirements. More research is required to make wind turbines more efficient.

Ocean acidity results from absorption of CO_2 and if the oceans eventually become sufficiently acidic this may badly affect organisms such as corals and plankton with carbonate skeletons. On the Precautionary Principle it is clear that Ministerial Targets for 2020 will not be met for CO_2 reduction. It will therefore be necessary to advance on three fronts, Mitigation, Adaptation and Geo-engineering. Adaptation to sea level rise must be accepted as an unintended consequence arising from ocean warming and expansion and melting ice sheets. It is estimated that by the end of this century, sea level will have risen between 1 and 2 metres. Redesign of the Thames Barrier will take into account the need to defend London from up to a 2 metre rise in sea level. How will those who live outwith the Thames Estuary be protected?

The division in the continental shelf between UK and Norway follows the geographical median line. The national claims to Exclusive Economic Zones in the Arctic are nominally 200 nautical miles, but may extend further if geological structures prolong the continental shelf beyond the 200 mile boundary. It was pointed out 35 years ago in this room that a government department for Marine Affairs was needed. Are government departments up to the task of managing Marine Affairs today, and if not what should be done? The Antarctic Treaty works very well, economic development is not permitted and nobody lives there, so any problems arising are manageable. The Arctic Ocean is surrounded by people with legal rights to claim within and without their EEZs. The Arctic International Common Space in the centre is in very deep water and unlikely therefore to contain significant oil and gas resources, but is nevertheless likely to remain a contentious area.

A Marine Agency was proposed but not accepted; however, a Marine Science Strategy was launched last week. We need a companion Marine Technology Strategy. There is nothing equivalent to a UN for the Oceans. UN Agencies dealing with the Oceans and Climate include UNESCO's IOC and the WMO. In addition, the FAO looks after Fisheries, UNEP plays a role in coastal seas, and the International Seabed Authority, in Kingston, Jamaica, assesses claims for EEZs. There is no major UN Session dedicated to ocean matters. The net result is the open ocean remains a global commons (hence overfished).

Long-term atmospheric observations are now well established as the remit of national meteorological agencies. Many countries have no oceanic equivalent, so the bulk of ocean observations (including most satellite missions) are normally funded by specific short term R&D budgets. Long-term commitments to ocean observations are needed (the oceans cover 72% of the planet's surface), and should be institutionalised in some way to avoid the short-term approaches of ocean business ventures and university funding. There is no Met Office equivalent for the Oceans, but the Met Office has taken on an operational role for ocean observations, which could be developed further, to provide the continuity required for ocean and climate forecasting. A multiplicity of research experiments has been undertaken globally, with huge disparities in the measurements made. A new regime is now required globally and locally, where everyone measures the same thing, using the same standards, over the same time frame and at the same parts of the tidal cycle, thus enabling us to see how the seas and oceans work. Can we ask DEFRA to do that for UK waters?

MARINE RESERVES – A KEY ROLE IN ECOSYSTEM-BASED FISHERIES MANAGEMENT

Dr Jean-Luc Solandt
Marine Conservation Society

Based on the evidence of international Marine Protected Areas (MPA) science, the Marine Conservation Society (MCS) believe there remains a need to develop extensive MPAs in UK waters. Science shows that fully-protected marine reserves, and well enforced MPAs have to be established over a significant proportion of the seas in order to allow the habitats of the seas to recover from decades of homogenisation of habitat and species complexity, and to increase ocean productivity. Evidence from well-managed and enforced MPAs result in tremendous positive changes in productivity, and spill-over (eg Georges Bank – a 17,000 km^2 closed area to bottom trawling off NE USA).[1]

On average marine reserves increase biomass by 446% and increase species diversity by 21% (when studies on 124 tropical and temperate marine reserves were compiled from over 200 peer reviewed scientific papers)[2].

The debate within the fishing industry has been dominated by three key questions: – what are MPAs for, what is the management needed to make them work, and what to do about displacement? Undoubtably, these are relevant questions from a UK fishing industry perspective that has seen only very small scale MPAs, temporal/single gear or species restrictions[3] set up in UK waters. MPAs in the UK have thus far been set up either to benefit fish or commercial stocks, and usually to protect only single species (eg cod), whilst allowing other species (eg haddock) still to be caught – sometimes with the same gear in the same zones.

The key to convincing society that MPAs have to happen in accord with more traditional effort-quota-based management, is the fact that 88% of EU fish stocks remain over-fished, and our fishing industry increasingly relies on subsidies and on species lower in the food chain (eg Nephrops, lobster, crabs and scallops), than was the case 50 and up to100 years ago. This chain of circumstances is not only because the larger species, in greater biomass have been declining up until this century[4], but also because the removal of large top-level carnivores such as cod and halibut has freed up those animals and plants lower down in the food chain, which are now more abundant. The marine ecosystem is fundamentally changed.

Some may suggest that the fishing industry can happily exist on invertebrates (nephrops and scallops), and a mixed species hauls from trawling which results in significant by-catch of invertebrates, and discards of undersize or over-quota and non-quota species, or one can simply suggest another management paradigm *which hasn't yet been used in UK seas* – marine reserves, and large MPAs which stop bottom trawling. These will increase production, species diversity and ecosystem complexity.

All this 'debate' on MPAs is in the face of inept management of CFP (Common Fisheries Policy) fisheries, where scientific advice on quota is consistently ignored by politicians in favour of short-term profits and jobs. Furthermore, traditional single species management approach ignores the fact that the same gear damages the seabed, regardless of what species is being targeted – eg bottom trawling for haddock and cod has the same ecological footprint on the seabed, regardless of the species being caught.

This is the choice that UK politicians have at the moment:

To invest in the future of the industry now by creating wide-scale MPA and marine reserve networks that protect the fish AND the ecosystem, and return the seas to productivity, or

To maintain the industry and environmental status quo, with low biomass and trophic level catches from a predominantly degraded ecosystem by an inefficient, subsidised industry.

Ecosystem goods and services provided by the marine environment are widely published:

carbon capture and storage
biodiversity
fish production
climate regulation
food security

The last point is worth investigating, and not often reported on. We must start to consider the potential of the marine environment to act as a

form of high interest rate bank account (an unfortunate yet useful analogy at this time). There is evidence from historical catches before the advent of the industrial revolution, diesel engines and freezers that the wider continental shelf acted as a huge reserve for fish, but in the late 1800s this started to change[5]. Not only were the average 'fishing smack' not equipped for anything other than day-fishing, they had no facilities for the overnight storage of fish (ie no ice). They had no diesel engines, and no generators powering vast winches to wind-in heavy and extensive fishing nets. Furthermore, they generally didn't have the power to trawl huge beams across the seabed.

The result was that sail powered fishing vessels often operated near to shore, used nets on open-water species such as herring and mackeral, and hook and line for bottom species such as cod and haddock – there was very little bottom trawling. As such there was virtually no co-lateral damage to seabed habitats, and waters beyond 5-10 nautical miles from shore were virtually unaffected by man, and a surplus of stock remained within these offshore grounds to supply the inshore fisheries. Offshore waters could be considered as *de facto* marine reserves. However, now all areas are exploitable, and even limiting days at sea to reduce the capture of finfish still results in beam trawls and scallop dredging harming the very fabric of biodiversity on the seabed, which helps support higher fish biomass.

MCS doesn't propose that fishers go back to only using line and sail power, but there is a middle ground (ecosystem-based management) between fisheries of 100 years ago, and those of today. And the most significant factor is to manage spatially both trawl fisheries (ie reduce it over significant areas of the seabed), and increase the number and scale of no-take marine reserves.

We must free up significant areas of the sea from fishing in order to:

Avoid habitat damage – not just for an increase in 'biodiversity' and 'habitat complexity'. The latter begets the former, by creating multiple niches via stochastic successional processes, and the fact that the build up of epifaunal biomass itself increases complexity of the seabed.

Increase the recruitment grounds for commercial species – the recovery of the seabed, and its complexity allows for a settlement/feeding habitat for a greater biomass of commercial species such as cod and scallop spat (eg Isle of Man and Georges Bank).

Develop a resource bank – No take is permitted inside marine reserves. Problems associated with banning one type of fishing (eg trawling and scalloping), can lead to vast increases in the use of static gears such as gillnets and pots[6]. This has impact on food webs, by-catch and the natural balance of species in areas of sea. The build up of natural resources in any no-take marine reserve will provide a 'bank' out of which adults can be caught that are exported outside the reserve boundary.

Understand the natural diversity and productivity of marine ecosystems – how can we say we sustainably utilise resources if we have no reference point – no 'benchmark' of sustainability, where ecological processes build up food webs to their natural levels?

Marine reserves provide a secure future for our fishermen – Ironically, it is the 'defenders' of the short-term interests of the fishing industry that are likely to do fishermen the most harm, by criticising the role of protected areas – particularly fully-protected marine reserves. We must invest in spatial protection now, to secure jobs for the future.

So why is there still the need to debate the science on marine reserves? Essentially this is because the rigorous scientific study of UK MPAs is wholly inadequate because:

UK MPAs are currently generally lacking the rigorous scientific design (eg BACI analysis) to enable rigorous scientific research to take place.[7]

UK MPAs don't often incorporate use of controls (apart from Lundy)[8].

MPAs are designed at different spatial scales, and over different habitats, and have different levels of effort and gear permitted within them – this makes rigorous interpretation of results in a controlled fashion rather problematic.

The vast majority of MPAs in UK waters set up for 'conservation' (European Marine Sites) don't effectively control harmful human activities[9].

UK Government is committed to the design of networks of MPAs such that the result of individual MPAs is greater than the sum of their parts. However, network science is even more nascent than individual MPA science[10].

The fishing industry and other groups have used the above reasons to fight against the implementation of wide-scale networks in UK waters, and their position is understandable, however detrimental to the long-term health and productivity of the marine environment. In light of the continued debate between conservationists and fishers about the roles and design of MPAs, it has been published that there is a need for UK politicians to progress *'rules of thumb'* on how MPA networks should be designed based on the best available evidence from abroad.[11] These involve measures such as protecting a representative set of marine habitats, in an agreed proportion of their distribution in UK seas.

So considering the international commitments of UK and other nations on the development of MPAs[12], coupled with the declines in food fish since the 1900's and more severely since the 1970s using traditional effort-gear management of fisheries, the Marine Conservation Society argues that it is simply good management to set up extensive MPA networks in UK seas.

1 Murawski *et al.* (2005). ICES J Science 62 : 1150-1167

2 http://www.piscoweb.org/files/images/SMR/2008/OverallIncrease.JPG http://www.piscoweb.org/files/images/SMR/TempTropIncrease.jpg

3 i.e. MPAs have to be permanent, fully-protected, and large (e.g. recommendations of the Royal Commission report on the Environmental effects of Fishing 2004)

4 Pinnegar *et al.*, (2000) Environmental Conservation 27(2) : 179-200.

5 Research by York University (in prep).

6 This has apparently been the case since the Lyme Bay order to close 10% of the bay to bottom-towed fishing gears.

7 BACI – Before, After, Control, Impact

8 Work commissioned by Natural England has near and far controls, but no 'before' data.

9 Current risk review of activities in European Marine Sites that can damage habitats and species.

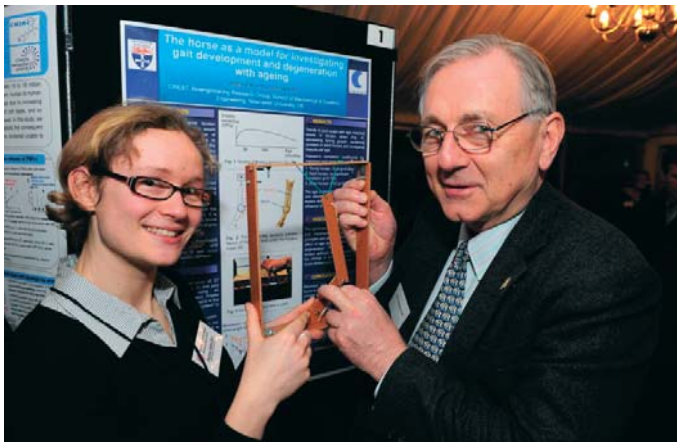
10 Stewart *et al.*, (2009) Conservation Letters 2: 243-253.

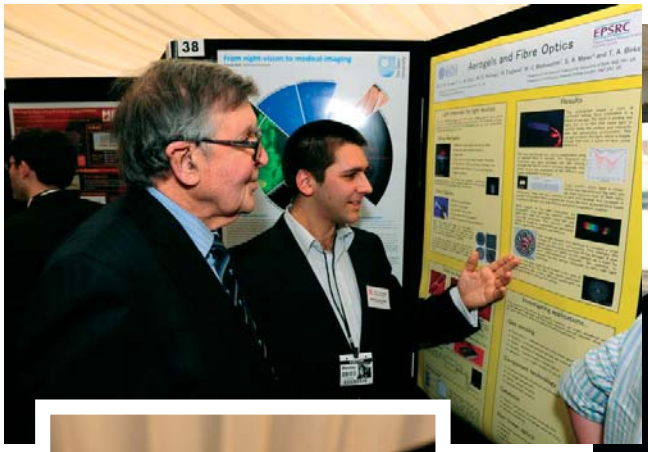
11 Jones and Carpenter (2009). Marine Policy 33(5): 737-743

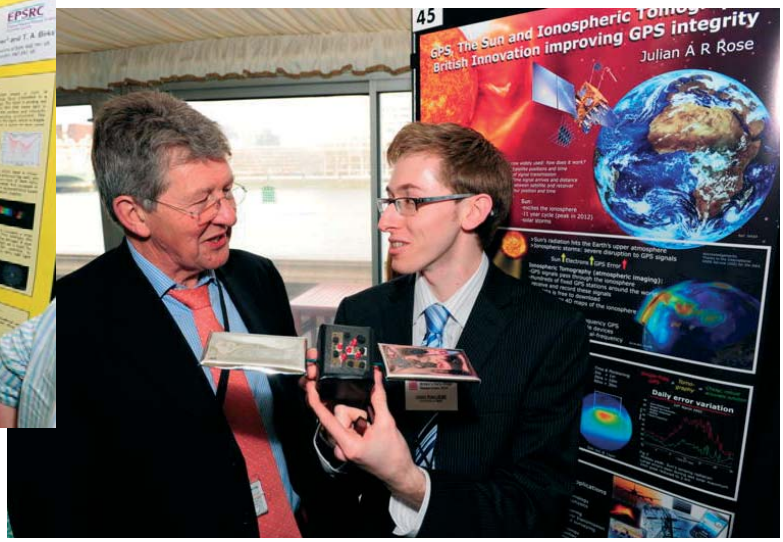
12 OSPAR / WSSD / CBD

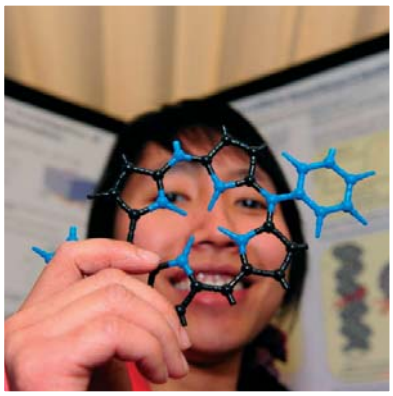
SET FOR BRITAIN 2010

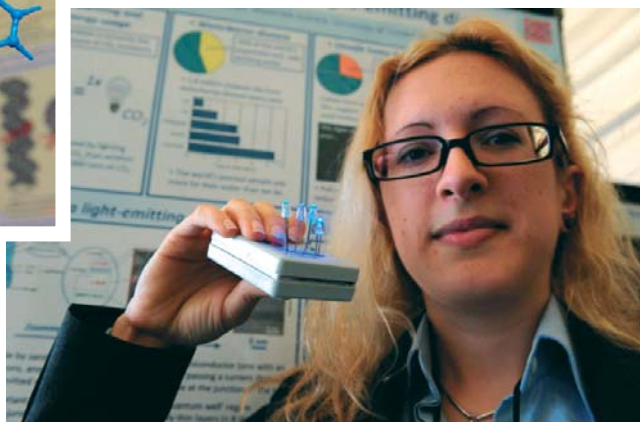
On Monday 8th March 2010 Dr Douglas Naysmith MP and Dr Brian Iddon MP, Vice-Presidents of the Parliamentary and Scientific Committee, acted as hosts for SET for BRITAIN, a poster competition and exhibition for early-career researchers. The competition had attracted just under three hundred entries in three separate sections and the top sixty entrants in each section brought their posters to Westminster to display in the House of Commons Terrace Marquee.











The competitors came from all over the UK and during the course of the day over sixty-five Members of the House of Commons and House of Lords visited the exhibitions in the Marquee to meet the presenters and see at first hand examples of the high quality research being undertaken in British institutions.

Each section of the competition was judged separately by a different panel of experts in the relevant scientific discipline. All agreed that the standard of entries was extremely high. In each section the winner received a medal and a cash prize and there were further prizes for runners up. At the end of the evening an overall winner, selected from the winners of all three sections, was awarded the Westminster Medal, sponsored by SCI in memory of Dr Eric Wharton, the founder of SET for BRITAIN, to whom Dr Brian Iddon pays tribute below.

The event was run by a working party which included Mrs Sue Wharton, widow of Dr Eric Wharton, Professor Alan Malcolm, Dr David Dent and representatives of the Royal Academy of Engineering, the Royal Society of Chemistry, the Institute of Physics, and the Parliamentary and Scientific Committee. Additional support was received from the International Agri-Technology Centre, Plant Impact plc, Monitise plc and AgChemAccess.

'SET FOR BRITAIN' HAS SURVIVED

A TRIBUTE TO DR ERIC WHARTON

Dr Brian Iddon
former Member of Parliament for
Bolton, South East

I first met Dr Eric Wharton when I was presenting 'The Magic of Chemistry', a 90-minute demonstration lecture, in Oxfordshire. At that time Eric was skilfully organising an impressive annual programme of events in the Thames Valley.

When I was elected to Parliament in 1997, Eric contacted me to propose an idea. It sounded a bit unusual, but I am not put off by unusual ideas or even unusual people with unusual ideas.

His idea was to hold a display of the work of young scientists on posters in the Palace of Westminster, the sort of thing that occurs at scientific conferences. Like me, this fellow Lancastrian was keen to raise the profile of science amongst Parliamentarians. In 1998, I hosted the first **'SET for Britain'** poster display in the House of Commons Terrace Marque for chemists and physicists.

From that first attempt Eric and his 'team' learned a lot. Few Members of Parliament attended, and I mentioned to him that refreshments and offers of photographs was the way to get them there. It was the photographer, always Frank, that proved to be the key to future success.

An annual event became a series of regular poster displays, for engineers and 'medics' as well as physical scientists, and Eric's team even 'went continental' – Heidelberg was their first stop.

Funds had to be raised, rooms had to be booked and professional scientists and engineers attracted to judge the posters, people as famous as Trevor Bayliss of clockwork radio fame. Eric was good at networking; he seemed to know everybody.

Young scientists from all over the country, indeed from all over the world if you count the foreign students who have attended these events, flocked to the Palace of Westminster. They loved the idea. One of the attractions was the prize money for the top posters – £5,000 for the first prize was not uncommon.

And, so, **'SET for Britain'** has become a brand name in the scientific community.

Then, tragedy struck. In 2007, Eric was diagnosed with pancreatic cancer and died shortly afterwards. We thought that was the end of **'SET for Britain'.** However, some time later, Sue Wharton proposed to me that she would like us to start it up again in memory of her late husband. An *ad hoc* committee was established of parliamentarians, industrialists, representatives of the learned societies and Sue Wharton, and the Parliamentary and Scientific Committee was persuaded to ensure that **'SET for Britain'** continues in Eric's memory.

Eric, a former civil servant in the DTI, was associated with several professional and learned societies. He held an executive position at the SCI and was responsible for setting up new Sections for them. Rather late in his life, he became a Fellow of The Royal Society of Chemistry (RSC).

I was very pleased when the University of Sheffield awarded him an Honorary Degree at their Degree Congregation, on 20 December 2006. He earned it.

Physical Sciences Session

12.30 pm - 2.30 pm

Entries comprised 24 Chemistry posters and 36 Physics posters, each discipline being judged by a separate panel of experts.

Chemistry Section:

Winner of group: £3,000 and Roscoe Medal:

ThaoNguyen Nguyen, University of Southampton
Porphyrin-DNA as Scaffold for Nanoarchitecture and Nanotherapy

Runner-up prize of £1,000:

Danny Ho, Pfizer Ltd
Hydrogen-Borrowing as an Environmentally-Friendly Approach to Parallel Amines Synthesis

ThaoNguyen Nguyen winner of the Chemistry group

Physics Section:

Winner of group: £3,000 and Cavendish Medal:

David Hall, Open University
From Night-Vision to Medical Imaging

Runner-up prize of £1,000:

Dr Michelle Moram, University of Cambridge
Lighting up Lives using Highly Efficient Light-Emitting Diodes

David Hall winner of the Physics group

Engineering Session

3.30 pm - 5.30pm

Winner of group: £3,000 and Engineering Medal:

Julian Rose, University of Bath
GPS, the Sun and Ionospheric Tomography: British Innovation Improving GPS Integrity

Runner-up prize of £1,000:

Dr Kosmas Tsakmakidis, University of Surrey
Trapped Rainbow Stopping of Light for Speeding up Computers and the Internet

Julian Rose winner of the Engineering group

Biological and Biomedical Sciences

6.30 pm - 8.30 pm

Winner of group: £3,000 and Mendel Medal:

Dorota Bartczak, University of Southampton
Stimulation of Blood Vessels Growth with Gold Nanoparticles

Runner-up prize of £1,000:

Dr Kimberley Bruce, University of Southampton
High Fat Exposure in Early Development Primes the Development of Adult Non-Alcoholic Fatty Liver Disease

Dorota Bartczak winner of the Biological and Biomedical Sciences group

GLASGOW SCIENCE CENTRE

By Kirk Ramsay
Chief Executive Officer, Glasgow Science Centre

Glasgow Science Centre (GSC) is located in the Govan area of Glasgow and was constructed as one of the major Millennium Projects, opening to the public in July 2001. GSC was intended to be a catalyst for regeneration in what had been a derelict docklands area of Glasgow for over 30 years. The area around the science centre has now become the digital media quarter of Glasgow with leading organisations such as BBC Scotland located on site as a direct result of the science centre having created a focus of commercial, educational, entertainment and tourist activities in this part of the city.

The riverside setting for the iconic buildings of the science centre creates a spectacular image of contemporary Glasgow and one that strongly reflects the impressive history and current success of the city in science, engineering and medicine. The buildings include the Science Mall, Glasgow Tower and the IMAX 3D Giant Screen cinema. The interactive exhibit areas are within the science mall. Glasgow Tower is the tallest free-standing structure in Scotland at 127m high and is unique in that the whole tower rotates from the ground up to face into the prevailing wind. A viewing cabin at the top of the tower offers panoramic views of the city and surroundings. The IMAX cinema shows the latest 3D films and a range of high quality science education films such as 'Hubble 3D' which is an excellent way to learn about the Hubble Telescope.

The vision for GSC is: A brighter future for Scotland through science experiences that engage, challenge and inspire.

Given the major social, economic, energy and environmental challenges we face the importance of science has never been greater. Engaging as many of our population as we can in interesting aspects of science that relate to every day life and therefore making science meaningful to each individual is a primary target for us. We do that by creating enjoyable, fun

experiences that challenge stereotypes of science and scientists and demonstrate that independent of age and experience science really is for all of us.

Our view is that "kids do not come by age, just by size" and we find that parents and grand-parents enjoy and learn just as much as the school-age children that are often assumed to be the only audience for a science centre.

Total admissions to GSC are 450,000 per year including 64,000 school pupils who come on curriculum-based visits from their schools. The new 'Curriculum for Excellence' introduced in Scottish schools encourages more integration of subject activities and 'learning outside the classroom' becomes ever more important to give experiences that cannot be replicated in the school. We have developed a range of programmes in conjunction with teachers to ensure that the fun experiences are also meaningful contributions to meeting the educational outcomes of the curriculum. Learning in informal environments is becoming a widely used term and science centres are excellent exponents of the techniques that lead to successful learning in informal environments. In practice we all do most of our learning outside of school, college and university. Having specialist centres that expose us to science, engineering and technology in highly interactive 'hands-on' ways personalised by our own interests and approaches is transformative and takes us away from traditional views of learning about science.

We use our science show theatres to gives interactive shows such as: 'Blood Bile & Body Bits' which all about the human digestive system, 'Bang or No Bang' which is about risk or chance, 'Flame-On' which about fire and combustion, and a long list of others. Where else can you have your hand set on fire – safely!

Our planetarium offers the best quality star field available to investigate the solar system and beyond but also acts as an interesting venue for related events. During 2009 International Year of Astronomy a long list of activities were supported. 'Stellar Sounds' is a series of music events with astronomical interludes under the stars in the planetarium and has been supported by a number of quality bands.

To celebrate the 40th anniversary of the first manned Moon landing, Glasgow Science Centre ran lunar themed activities for the whole family, one of which investigated the allegations that the moon landing was a hoax and did not actually take place. Being able to investigate such issues in direct dialogue with experts in the field is a powerful way of getting past the 'hype' to the reality, particularly when you can test out some of the key allegations by getting your own hands on experience to augment the expert discussion and demonstration. Bringing members of the public into working proximity with experts from a wide range of disciplines is something that the science centre does very well. We guard the integrity of our work closely so that the high levels of confidence visitors have in us is maintained.

Our main exhibition areas usually have approximately 400 interactive, hands-on exhibits in place covering the physical sciences, medical science, risk & ethics, innovation & invention.

At present we have the 'Wallace & Gromit Present A World of Cracking Ideas' exhibition on one of our floors providing a focus through this summer for our innovations theme which is a developing area of interest for all as we see the possibilities of new opportunities opening up in social, economic and cultural exploitation of innovation from sources throughout our population. Again, the key differentiator is 'hands-on, brains-on' activities that enable us to see and feel the results of our actions and efforts. The science centre experience is different from most others because the predominant outcome of the engagement is the personal impact of the immediate and often unexpected response that results from our actions that can be retried, experimented with, followed up and extended through our own efforts or facilitator and expert support.

Extending the science centre experience outside the building is an important aspect of our work. GSC has an extensive outreach programme for schools and communities that covers all of Scotland and in the last year engaged with over 62,000 individuals. Our 'Bodyworks On Tour' exhibition explores the amazing machine that is your body developing a health and wellbeing theme that is of real value to all children and adults through exciting interactive exhibits and programmes that can be individually or competitively applied. Schools always welcome these visits as high value-add to the curriculum that produce excitement and motivation as well as desired learning outcomes for the children. As a consequence our tour programme is usually fully booked and further expansion is expected to meet the demand.

Glasgow Science Centre is representative of the high quality image, impact and success that align with science, engineering and technology in our society and an example of how we can engage and motivate people to become informed and active citizens of our knowledge age.

HOW TO AVOID METAL SUPPLY SHORTAGES IN THE UK

Dr Hazel Prichard

At a time of concerns over shortages of commodities such as oil, and of fear posed by climate change, the potentially damaging threat of metal shortages is apparently being ignored. Geological occurrences of metals are very unevenly distributed around the world. Some are concentrated in single countries that may not be politically friendly to the UK and some have specific essential uses with no known substitutes. Metals are used extensively in manufactured goods and with the lack of a stakeholder body to monitor and take an overview of metal supply it is unclear which metals are likely to have restricted availability in the near future.

MATERIALS - WARNING OF SHORTAGES

Although the world's metals are ultimately finite, an imminent crisis in metal supply in the UK is more likely to be due to a complex interplay of a broad range of factors.

Geology Availability of metals depends not only on their abundance but also their geological distribution. For example, copper is found in different geological settings including in giant low grade deposits called 'porphyries' occurring in collision zones such as those around the Pacific rim, as well as in black shale associated with hydrothermal fluids in large sedimentary basins such as near Duluth in the USA, in volcanogenic massive sulphide deposits formed from fossil black smokers as in the Ural mountains and in large igneous magma systems associated with nickel as in Noril'sk in Northern Siberia. Similarly, gold occurs in many different types of rocks in many countries. In contrast, other metals have a very restricted geological distribution occurring in specific geological rock types in only a few countries. For example, major platinum deposits occur in just two countries; the Republic of South Africa and northern Siberia.

Exploration Metal availability is increased by discovery of new ores. This depends on utilising knowledge and expertise to produce exploration success. Exploration often focuses around old mining sites, or is undertaken in areas of similar geology to other known deposits and in new types of geology where models predict ores. Exploration is easier in some climatic zones such as deserts and more difficult in forests and jungles but it may become easier after deforestation (e.g. the Amazon) or ice retreat (e.g. Greenland). The search for metals is influenced by the structure of the exploration industry and the distribution of geological expertise for each metal. Exploration is conventionally carried out by individual mineral prospectors or small sized junior companies that sell-on their findings to large multinational mining companies who are able to finance development and mining operations.

Reserves Ore deposits, by their very nature, are partially hidden subsurface. The calculated size and grade of any deposit are only an estimate of the actual resource based on the quality and abundance of the available data. This gradually improves as a deposit is evaluated prior to extraction. Companies tend to prove reserves of metals for a period of say 15-30 years into the future. This does not indicate that the metal will run out at the end of this period, just that it is uneconomic to explore for more metals further ahead than this. Intensity of exploration for a metal will decrease if sufficient resources are known but it will increase as scarcity occurs and prices rise.

Exploitation It is essential to be able to extract the metals from their ores. The host minerals for metals vary in many different ways such as composition, the size of the grains and the way different grains lock together. In turn, the ease with which the metal-bearing minerals are separated from 'waste' minerals also varies markedly. New technologies can make ores available and allow waste tips and lower grade ores to become resources. As metals become scarcer lower grade ores and multiple metal production from polymetallic deposits may become economic; some metals may be economic to mine only as by-products of others. Mineral processing and refining often consist of a series of procedures that may not be completed at the extraction site. Partially processed ore is routinely shipped to other sites, often in other countries, for final processing or smelting. Exploration in geographically remote, politically unstable or hostile areas may be impossible and even known ores maybe inaccessible. Arguably today's world is characterised by conflict and this affects exploration, exploitation and raw materials supply. High transport costs for a bulky ore can be prohibitive whereas low bulk precious metals can be transported with ease.

Legislation The intensity of exploration is governed by politics within a country. Permission for mining in different countries may vary dramatically. For example uranium mining may be limited due to environmental concerns. Regime change in countries may or may not make conditions more favourable for exploration and mining. Many countries have government owned mining

operations and may encourage joint ventures, charging royalties for the extraction. Thus governments and multinational companies in different countries influence or control the supply of metals. Access to information on resources may be restricted where metals are strategic and confined to only a few countries that have favourable geological formations to host individual metals. Countries with strategic metals may restrict supply and others may buy whole mines in foreign countries to ensure their supply needs are met. Some countries maintain secrecy about their metals whereas in others resources are poorly known and unexplored. Some countries, where governments are restrictive, have not been subject to major exploration recently and hold potential for new discoveries.

Recycling Increasingly in developed countries infrastructure is being put in place for collecting and recycling metals. This increases sustainability and reduces pollution and dispersion of these metals into the environment. Metals from anthropogenic sources rather than natural ores are increasingly being considered but the contained metals are often present in different mineralogical forms than in natural ores and present new challenges for recovering the valuable constituents.

Demand There may be dramatic increases in demand as new uses are found for particular metals or reduction as substitutes are discovered. Shortages may occur due to a time lag between rising demand and the period required to increase mining output; a new discovery of ore may take decades to develop into a producing mine. Rapid industrialisation in emerging countries may dramatically change demand patterns causing overall shortages.

SKILLS – WARNING OF SHORTAGES

Training and Education My interest in this area of study is derived from 30 years studying the processes that concentrate metals in geological environments. I currently run the only undergraduate degree in Exploration and Resource Geology in the UK at Cardiff University. There is a great demand for this course by very bright, practical, well travelled young people who often have links with the exploration industry. However, numbers currently being trained in the UK are small compared to former times. We used to be a major well respected exporter of exploration geologists but this has dwindled as the mining industry has been reduced in the UK; yet it still seems a legitimate role for the UK. Sourcing metals is global and needs to be understood at all scales from continental exploration to 1 micron scale mineralogy. Teaching in universities should be research-led. Funding for research into exploration is not easy to obtain in the UK as this academic research is seen as too applied for Research Councils to fund and too far from the market for companies to fund. As a consequence much time is spent raising funds by pretending that the research is for something else, often either blue sky or environmental. There is no high profile body nourishing this type of UK science that forms the middle ground between blue sky and applied research. A stakeholder group would help to inspire and facilitate young people to enter this field.

THE DEBATE

Do we leave these risks of metals shortages entirely to the market or try to intervene to smooth out the risk extremes? Should there be a network of stakeholders? This would monitor the overall demand for metals, identifying and suggesting solutions to foreseeable weaknesses in the overall supply chain? If so, how should such a network be managed? Which stakeholders should be involved and what questions should be addressed? Should we support the unfashionable? Climate change has potentially far reaching consequences and research should be funded but should we loose sight of possible supply problems for metals? Does the UK wish to support training and education of young people to go into the global exploration industry to maintain our interest in the supply chain of metals? Should there be an interconnected mineral exploration knowledge base in the UK including geological, geochemical, geophysical and mineralogical theory and practical detective skills for locating mineral deposits? Should there be an expansion of research to create models to predict and locate more resources and to develop new technologies and collaborations to process new ores? Should the UK have the capacity to promote a world wide debate to consider the rapidly changing distribution of metal availability? New initiatives for assessment of 'impact' of research in UK universities indicate that there is a growing interest in the use of applied science but does this area of metals availability have access to the research funds that it needs? Should public understanding of mineral exploitation be promoted? Although sustainability is accepted to be desirable there appears to be a lack of public awareness of the essential role of the exploration and mining industry in maintaining living standards. If we are alerted to shortages in metal supply we may be able to take actions to secure continuous supplies before there is a crisis and so be forewarned of possible future shortages. Access to research funds will support the development, on more than one front, of strategies to hedge against future shortages. This will help both to maintain our living standard in the UK and assist the whole of civilisation to use the world's resources more sustainability for the prosperity of everyone.

STAKEHOLDERS

Some knowledge of metal supply was previously held in DTI and the British Geological Survey, and maybe now some is held by the EU. Large international companies are likely to have confidential information and data should be present within the London Metal Exchange. Some rather fragmented research is being done in Universities with a few teaching economic geology and mining especially at MSc level. The end users of metals such as manufacturers of cars, IT and electronics are likely to be aware of metal supplies. Such a group of stakeholders would in effect be a 'metals availability forum,' real or virtual, that would be able to develop an overview of metal supply, joining up currently disparate information.

MAKING A BIG BANG

With 22,545 people in attendance including over 15,000 children and young people and over 4,000 teachers, parents and guardians, The Big Bang UK Young Scientists' and Engineers' Fair 2010 was the biggest single celebration of science and engineering for young people in the UK and made a lasting impression on all who visited.

UK Young Engineer of the Year Shawn Brown

With cross-party support from a wide range of MPs, the three-day science and engineering spectacular enjoyed an excellent turnout in Manchester this March and will be followed up by twelve regional Big Bangs later this Summer. With the help and support of MPs and communities across the UK, the regional fairs will inspire and engage a whole host of new participants not only to attend the national Fair but also to consider taking part take in the National Science & Engineering Competition.

Involving over 110 organisations from across the private, public and voluntary sectors, and reaching out to schools and students across the country, The Big Bang 2010 represented an unprecedented partnership of the UK's science and engineering communities, and demonstrated a real desire to come together to celebrate and raise the profile of young people's achievements in science and engineering. Staged in Manchester Central, this year's event attracted more than three times as many attendees as The Big Bang 2009. From welding with chocolate, mapping the human genome and exploring the hospital of the future, there was a real buzz in the air as children and young people discovered firsthand the wonders of science, technology, engineering and maths (STEM). As Head teacher Annie Leonard from Cumbria commented, "There was something for everyone and we came away wishing we had more time to spend there".

For all the fun of The Fair however, The Big Bang was an event with a serious aim; to promote STEM careers to young people and address related skills gaps across the UK. This overarching aim was pursued throughout the three-day event not least via The Big Bang careers awareness programme developed by EngineeringUK and The Science Council in partnership with the DCSF. The first integrated careers programme of its kind, this involved careers speed networking events, an interactive careers quest, co-ordinated careers resources, and a series of live panel debates involving National STEM Careers Co-ordinator Kate Bellingham; Juergen Maier, Head of Siemens Industry Sector UK; and Joanna Woolf, Chief Executive of Cogent. All were aimed at children, parents and teachers to provide study hints and tips, as well as concrete examples of how STEM careers are creative, useful and desirable.

Guests included HRH the Duke of Kent, Lord Mandelson First Secretary of State and Secretary of State for the Department of Business, Innovation & Skills, as well as Olympic Gold Medallist Amy Williams, Professor Jim Al-Khalili, Professor Marcus du Sautoy, the cast of Sky One's Braniac, and all four of the BBC's *Bang Goes the Theory* presenters – one of whom arrived in Manchester in a sustainable, coffee-powered car.

In addition to the shows, celebrities and interactive activities, The Fair also featured National Science & Engineering Competition, led by The British Science Association, from which ten overall prize-winners were drawn as finalists. The ultimate titles went to UK Young Engineer of the Year Shawn Brown for his solar-powered bamboo bike made from sustainable, reusable material and UK Young Scientist of the Year Thomas Hearing for his project mapping the eroding ammonite pavement of Monmouth Beach.

Sir Anthony Cleaver, Patron of The Big Bang, said:

"More than just a great day out, The Big Bang 2010 gave over 15,000 young people and equally importantly over 4,000 teachers and parents, the opportunity to explore many exciting opportunities in science and engineering. I would like to thank our many Parliamentary supporters as well as the hundred and ten organisations which came together to make this possible for ensuring the experience was so memorable and inspirational for everyone who visited."

For more information about The Big Bang 2011 as well as regional fairs across the UK visit www.thebigbangfair.co.uk.

For more information about the National Science and Engineering Competition visit www.nationalsciencecompetiion.org

PANDEMIC INFLUENZAS

Lord Soulsby of Swaffham Prior

Highly contagious, acute, respiratory illnesses have been known to affect humans since ancient times. Hippocrates recorded an epidemic in 412 BC and numerous outbreaks were described in the Middle Ages. These were known as influenza, originally an Italian name which was adopted in Europe to explain the sudden and unexpected appearance of what was thought originally to be under the influence of the stars (Brown and Alexander, 1998). The first well recorded pandemic was in 1580 in which it is believed the viral infection spread from Russia to Africa and Asia killing more than 8000 people and devastating several Spanish cities. Russian flu in 1880-1890 killed upwards of 1 million and reached North America and Latin America.

However, the most lethal flu on record was that designated "Spanish Flu" of 1918-1919 which killed between 20 and 100 million and was global in nature occurring from the Arctic to remote Pacific islands. The causative agent is now agreed to have been a flu virus (H1N1), swine flu, though there are many opinions why it should show such virulence and affect the younger end of the population (ages 20 to 40 years) and particularly armed forces personnel. 43,000 deaths occurred in the US forces alone which was about 80% of the total number of US battle deaths in the First World War. The acute nature of the disease in the younger end of the population has been attributed to a "cytokine storm" which is a lethal over-reaction of the immune system to the virus infection which replicates very fast and unleashes cytokines. Masses of virus rapidly overwhelm the immune system.

A brief word about the agent. Influenza viruses belong to the Orthomyxoviridae family of which there are three genera; one, type A and B viruses, a second containing type C and a third of "Thogoto-like" viruses (International Committee on the Taxonomy of Viruses, 1995). There are 15 different haemagglutinin (H 1-15)and 9 neuraminidase (N 1-9) subtypes based on serological testing with haemagglutinin-inhibition and neuraminidase-inhibitin tests respectively. Types A, B and C infect humans but generally infections of other animals are restricted to type A and only A viruses have been isolated from birds. "A" viruses only have produced the devastating pandemics of human populations (Brown and Alexander, 1998). But pandemics in animals, though not known as such, have caused serious disease. An example is influenza equi 2 which caused serious disruption of racing (Newmarket Cough) and of events involving cavalry horses such as the Trooping the Colour which for the first time in history caused the ceremony to be performed on foot.

In 1957-58 the virus of Asian flu started in China, originally having mutated from wild ducks and then combined with a human strain: it killed 1-1.5 million people. With the Hong Kong flu of 1968-69 the virus (H3N2) started in Hong Kong and then spread across Asia to India and northern Australia. US troops returning home from Vietnam carried the virus to the US. It killed 750,000 to 1 million people, particularly children and middle-aged adults.

While much can be learned from each pandemic, it has not been possible with certainty to predict the progress or outcome of a pandemic. An example of this was the outbreak of swine influenza A at Fort Dix, New Jersey, in 1976. This outbreak also became known as the swine flu fiasco or the swine flu debacle.

On February 5th 1976, an army recruit, Private Lewis, at Fort Dix felt tired and weak after an all-night hike. He died the following day and four of his companions were later hospitalised but survived. Swine flu, apparently closely related to the strain involved in the 1918 pandemic was incriminated and alarmed public officials convinced President Gerald Ford that every person in the US should be vaccinated against the disease. Eventually 24% of the population was vaccinated and the programme was halted on December 16th, 1976. The outbreak of Fort Dix Swine Flu (H1N1) did not spread beyond Fort Dix; it caused one death and severe respiratory illness in

. . ."Spanish Flu" of 1918-1919, killed between 20 and 100 million and was global in nature. . .

13 soldiers. However, a more serious sequel to the Fort Dix event was the occurrence of the Guillain-Barre syndrome in some vaccinates. Some 50 million people were vaccinated at an estimated cost of $100 million. Overall about 500 cases of Guillain-Barre occurred resulting in death from severe pulmonary complications in 25 persons. Other influenza vaccines have not been linked to the Guillain-Barre syndrome. Questions remaining unanswered about the Fort Dix outbreak include where did the New Jersey virus come from and why did transmission stop?

An outbreak not considered a true pandemic was the 1977 Russian flu. This began in Northern China and spread rapidly around the world but affected only children and young adults.

Avian influenza was first recognised in chickens in 1878 and is known to be widespread in waterfowl since the 1970s. An outbreak of avian flu in broilers in Pennsylvania and Virginia in 1983-84 led to the slaughter of 11 million birds at an approximate cost of $61 million. Two forms of avian influenza virus are recognised, highly pathogenic avian influenza (H5N2) (in broilers in Mexico, 1993) and low pathogenic avian influenza (H7N1) (in Italy 1997-2000). Avian strains can spread to mammals, including humans, resulting in serious epidemics. In 1997-98 there was world-wide concern after an outbreak of the highly pathogenic H5N1 avian influenza spread from chickens in Hong Kong to humans. Hong Kong authorities slaughtered 1.5 million chickens in December 1997 and the export of chickens was banned in an attempt to prevent further spread of the virus. However, six people died and a further 12 were severely affected in the following months; the patients had no contact with each other and had no common exposure. This raised concerns that a pandemic similar to the 1968 Hong Kong outbreak was in the offing. Avian H5N1 infection was previously known to infect only birds and the Hong Kong cases were the first human infection with avian H5N1. H5N1 appeared to have been transmitted directly from chicken to human rather than from birds to pigs first and then from pigs to humans. Since 2003 the H5N1 strain has caused more than 60 deaths in South East Asia but no human fatalities have been recorded in any other continent. A major concern has been that this strain could cause serious havoc by genetic mixing with the human influenza virus. To date this has not happened and human infections have occurred where there has been close contact between infected poultry and backyard individuals. In some rural poverty areas the dead bird, possibly a domestic pet has been consumed by the family, humans being infected when dissecting the carcase. Several agencies (eg WHO, FAO, Federation of Veterinarians of Europe) have stressed the need to contain the disease at its roots, even though migratory birds, particularly waterfowl, may transport the virus long distances over Europe, the Mid East and northern Africa. To this end funding for surveillance and vaccination programmes in the Far East has been made available through FAO and other agencies.

An extensive and excellent account on pandemic influenza with respect to avian flu is given by the joint publication of the Royal Society and the Academy of Medical Sciences (2006: Pandemic Influenza: science to policy, Policy Document 36/06). This covers exhaustively animal hosts, epidemiology and surveillance, antivirals, vaccination, public health and science and policy making.

. . .waterfowl, may transport the virus long distances over Europe, the Mid East and northern Africa. . .

Since avian influenza is a disease of birds the British Veterinary Association has provided a guide for the profession for highly pathogenic avian influenza (HPAI) not only for stocks of commercial poultry but also ostrich farming and other ratite species (emu, rhea, cassowary), breeders of captive birds (parrots, canaries) and game birds (pheasant, partridge) birds in zoos and wildlife parks and birds of prey (falcons). The BVA stresses that human infection with avian influenza is rare and occurs usually through close and prolonged contact with live infected birds. Though H5N1 is essentially an avian virus, contact with feral and wild animals has been determined to be a strong risk factor, especially in small-scale commercial production systems which predominate in the Far East. Under these circumstances biosecurity is often poor and infection and transmission, especially with highly pathogenic H5N1 (HPAI) has been reported for dogs, cats and civets in Bangladesh (Biswas et al 2009).

Mexican Swine Flu is now the infection causing urgent concern globally. The origin of what is now recognised as H1N1 possibly was in a teenage boy in 2005 in Wisconsin who helped in the butchering of pigs at a local slaughterhouse at Thanksgiving: the boy's family also bought a chicken and kept it at home over the holiday period. On 7th December 2005 the teenager came down with flu which lasted 3 days but no other member of the family took ill. The virus appeared to be a mosaic of a wild bird form of flu, a human type and a strain found in pigs. It is now thought that the Wisconsin virus was a step along the evolutionary tree leading to a virus that in four years' time would mesmerise the world.

In 2009, a young man, Edgar Enrique Hermandez of La Gloria, Mexico suffered a bout of flu, later found to be H1N1, a mosaic of swine, bird and human flu! The infection spread rapidly globally and on June 11th 2009 the World Health Organization raised the pandemic level for H1N1 to phase 6 or global pandemic status. More than 70 countries reported cases and by late November 2009 the WHO confirmed some 700,000 of H1N1 and over 8,700 deaths in 207 countries. The USA and Canada have been heavily affected with over 1,800 deaths and the Americas (North, Central and South) account for about two-thirds of H1N1 deaths worldwide. Interestingly, H1N1 has had least impact in

Africa where just 104 deaths have been recorded out of 15,500 confirmed cases.

The rapid spread of Swine Flu dominated the news media for months and estimates of potential infection and mortality rates, disruption of essential services such as police, hospital facilities and schools were projected at all levels, including Parliament. Proof of the origin of the present H1N1 from swine has not yet been confirmed. Swine influenza is a contagious disease of pigs that occurs worldwide and virus types H1N1, H1N2 and H3N2 are endemic in many pig populations round the world but there is no good evidence of inter species transmission on a significant scale. The present H1N1 influenza virus, though assumed to be of animal origin (ie is a zoonosis), is now spreading from human to human. Whether H1N1 can act as a reverse zoonosis, ie human infection being transmitted to pigs is less clear. On one occasion in Canada a case of human to pig transmission followed contact of an occupationally exposed worker incubating the H1N1 virus following return from travel to Mexico (Irvine and Brown 2009).

An experimental study to determine the infection dynamics, clinical outcome and transmissability of H1N1 in pigs was undertaken by a consortium of 9 institutes and organisations from 8 EU member states (Brookes, Irvine, Nunez et al 2009). Pigs were susceptible to infection with influenza A (H1N1) resulting in detectable levels of clinical disease, virus shedding and respiratory tract pathology. However, mortality was not a feature of the experimental infection and infected animals were able to transmit the virus to naïve contact pigs, suggesting the virus could become established in susceptible pig populations.

The fact that H1N1 has been designated Swine Flu or Mexican Flu has generated unsustainable responses. Thus, following the initial reports of H1N1 – swine flu, the Egyptian government decided to slaughter 300,000 pigs even though the country is predominately Muslim and therefore not pork consuming. Veterinary authorities such as FAO and OIE along with WHO have stressed that influenza viruses are not known to be transmissible to humans through eating pork or pork products derived from pigs. Heat treatment commonly used in cooking meat, 700°C core temperature, will readily inactivate any virus potentially present in raw meat products. Pork and pork products handled by good hygiene practices will not be a source of infection; however, meat from sick pigs or those found dead should not be used for human consumption under any circumstances.

The virus of Swine Flu in 1918 was uniquely virulent and though most patients experienced symptoms of typical influenza with a 3- to 5-day fever followed by recovery, histological and bacteriological evidence demonstrate the vast majority of influenza deaths resulted from a viral-bacterial-host interaction with secondary bacterial pneumonia. Diagnostic virology was not then available but bacteriology was a flourishing discipline and bacterial super infection of viral diseases, eg measles, was often fatal.

. . . the Wisconsin virus was a step along the evolutionary tree leading to a virus that in four years' time would mesmerise the world. . .

Compared with the number of antibiotics available for bacterial infections, of which many are resistant, some multi-drug resistant to a range of antibiotics, there are few antiviral drugs available for the treatment of H1N1 infections. Two, oseltamavir (Tamiflu) and zanamivir (Relenza) are currently recommended for the treatment of influenza. A major concern with the use of these antivirals is the development of antiviral resistance. Originally, Tamiflu was prescribed to ease the symptoms of flu and its duration. However, as concern for H1N1 markedly increased, Tamiflu has been prescribed and administered as a prophylactic. The WHO does not recommend that antivirals be used for prophylaxis as the more a drug is consumed the more opportunity there is for resistance to develop and spread, making the antivirals ineffectual when they are actually needed. The US Department of Health and Human Services similarly does not support prophylactic use, arguing that most people who get sick don't need Tamiflu. Virus strains resistant to Tamiflu are still susceptible to Relenza. Some authorities have recommended a cocktail of Tamiflu and Relenza as mutations conferring simultaneous resistance to multiple drugs are less likely. However, this is not an approach which has generated major support. National preparedness has been an important issue in many western countries. The UK stockpile of antivirals is aimed to provide treatment for the majority of the population and is reported to be ahead of most other countries. Details of stockpiling, availability and

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distribution of antivirals are now available from health agencies, local and national.

An obvious step forward is the production and use of a vaccine against H1N1. A vaccine against the newly emerged H1N1 strain would slow or even stop the spread. of the virus, however, existing flu vaccines administered in the autumn against "regular seasonal" flu will not prevent infection with H1N1 and hence a new vaccine is required, as is indeed the case for seasonal flu, owing to the antigenic shift of the flu virus, and each year influenza viruses isolated from epidemics are characterised in WHO Influenza Reference Laboratories. However, vaccine makers have a dilemma in that ordinarily vaccine producers would be producing vaccine for regular seasonal flu, primarily for the elderly, whereas a swine flu vaccine would be aimed at the younger end of the population. Vaccine production cannot be achieved over night. Cultivation of the virus in hens' eggs is part of the process, which takes time (3 days) but weeks are required for testing and formulation. A detailed account of the development of H1N1 vaccine, regulatory issues and advances in vaccine science, including alternative vaccine production techniques is given in the Parliamentary Office of Science and Technology POSTnote on H1N1 "Swine Flu" vaccine (May, 2009, number 331).

The early indications of the possible extent of swine flu were that it was spreading rapidly and would continue to do so. In the early part of 2009 cases were doubling every week and 100,000 cases per day were projected. It was expected that as autumn and winter approached and the normal flu season occurred swine flu would become a most serious national entity. The possibility of 65,000 deaths was predicted over the winter period. The similarity to the 1918 pandemic was stressed and urgent action to produce sufficient vaccine was undertaken. Enough vaccine was ordered to protect the entire population of the UK (60 million doses from GlaxoSmithKline (GSK) and 30 million from Baxter). However, the anticipated "third wave" of the pandemic did not materialise. Global deaths to Jan 5th 2010 totalled 13,324 (360 in UK, 2160 in USA, 509 in China, 823 in Mexico and 1,632 in Brazil) (Data from Rose, 2010). As a consequence, millions of doses of vaccine remained unused, estimated to be 60 million (Rose 2010).

High stocks of unused vaccine also occur in France and Germany who have decided to sell unneeded vaccine. Some countries plan to ship surplus vaccine to countries with a shortage though some countries with a shortage may not need vaccine supplies, as, for example, some in the African continent have been least affected, suffering fewer than 150 deaths continent-wide.

One point is clear about influenza, be it a normal seasonal form or a pandemic, namely it is difficult, if not unwise, to predict the outcome at the start of an outbreak. It is also unwise to take heed of the lessons to be learned from the Swine Flu pandemic and indeed the other pandemics that have preceded it.

Swine flu has presented a field day for newspaper reporting of incidents associated with the flu from around the world. China imposed quarantine restrictions on visitors holding Mexican passports and also on entire school groups from overseas, eg on 65 students from St Mary's School in Oregon, a few of whom subsequently tested positive for H1N1 Swine Flu. Despite protests from around the world, China isolated plane loads of people if anyone on the flight exhibited flu-like symptoms. Chinese authorities maintain that these measures may have helped to slow the spread of the infection in the world's most populated country. H1N1 flu, or in fact other forms of flu are not respecters of political niceties and measures to dampen down transmission by whatever political persuasion are to be welcome.

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When will the next pandemic occur? The majority of health officials believe it is not if but when. WHO surveillance of flu viruses will do much to identify the next zoonosis of flu, since almost all human flu is derived from animals. However, the truth may lie in our stars since Yeung (2006) has hypothesised that sunspot cycles may detect pandemic influenza A in 1700-2000! A hypothesis worth reading.

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SINGAPORE: SCIENTIFIC PRODIGY

In this article, Sam Myers, Southeast Asia Regional Director for the Science and Innovation Network (SIN), provides his insight into how Singapore has risen to become a world-class centre for R&D.

During my three years in Singapore, some things, such as the weather, have remained constant day-in day-out. The same cannot be said for investment in science and its related infrastructure, which have grown rapidly. Back at the turn of the millennium the total R&D spend (GERD) stood at 1.9% of GDP, after which the Government set the ambitious target of 3% GERD by 2010. The country is on course to meet this: the latest figure hit 2.8%, with 72% coming from the private sector (2008). Earlier this year the Government's Economic Strategies Committee revised the target upwards to 3.5% by 2015. So how has Singapore invested this funding, and how did it achieve its ranking by the Boston Consulting Group as the most innovative country in the world in 2009?

Many people compare Singapore to a well-run company. The small city-state has been adept at leveraging off its historical manufacturing strengths to climb up the value chain. Manufacturing accounts for more than a quarter of GDP, and there has been a Government-driven shift from electronics and silicon production into interactive and digital media, and from chemicals and pharmaceutical manufacturing into biomedical research. Tailored packages of incentives have attracted the R&D operations of multinational companies such as Rolls Royce, GSK and Shell, which have fuelled this transition. Like any corporation, the island also faces a number of challenges: no significant natural resources, scarcity of land, and difficulty meeting growing water and energy demands. Science funding has been harnessed to address these challenges, and the Government has positioned the country to be a regional hub for R&D and a gateway to Asia for the western world.

This investment is complemented by policies to develop human capital and scientific infrastructure. Many eminent foreign researchers, including a sizeable number of Brits, run labs and hold senior advisory positions in Singapore, such as Sir George Radda, Sir David Lane and Sydney Brenner. In parallel, home-grown talent is being cultivated through scholarships at top international universities. Many choose UK institutions such as Cambridge, Oxford and Imperial College, and there is a requirement that such students 'repay' the sizeable investment in their education by working for several years in Singapore upon completion of their programme. Academic excellence is celebrated and rewarded in Singapore, and there are few problems in recruiting the brightest young minds to the sciences. In fact three-quarters of the current 21-strong Cabinet hold a science degree and just under half went to Cambridge.

The Government has also built a world-class infrastructure to attract and support these researchers: just 18 months ago I witnessed the opening of the iconic state-of-the-art "Fusionopolis" which hosts engineering and physical science research alongside the biomedical hub, Biopolis. Once the next phase is complete, some 10,000 scientists will work within a 4km radius. These impressive buildings co-locate public R&D labs alongside private companies with shared services such as animal facilities and clean rooms. They provide a 'live-work-play' environment to encourage researchers to interact with each other outside the lab – and to spend even longer hours in the lab!

This strategy has built Singapore into a global R&D player in little over a decade. The next big challenge comes in translating this investment into economic wealth. A number of hurdles need to be overcome, such as increasing the availability of private equity to support spin-outs, and growing the entrepreneurial talent pool. More needs to be done to stimulate inter-disciplinary research: the co-location of Biopolis alongside Fusionopolis by itself is not enough.

There is every reason to believe Singapore will rise to meet these challenges, and UK researchers stand to benefit from this impressive growth story. The SIN team was established in the British High Commission in 2003, to help UK researchers identify Singaporean partners, and access scientific resources across Southeast Asia. Since then we have organised over 50 workshops, introducing hundreds of UK scientists to local counterparts and stimulating new partnerships and collaborations in a range of priority areas ranging from stem cells to renewable energy. These have resulted in numerous joint scientific papers, grants and industry R&D partnerships. Most recently, 6 successful infectious disease projects were announced under the £2m UK-Singapore collaborative fund, which we facilitated between the UK's Medical Research Council and A*STAR. These projects address drug resistance and the development of novel detection devices in a region which is a hotspot for the emergence of infectious diseases.

The SIN team will continue to keep the UK science base up to speed with developments in Singapore and help our researchers access the opportunities provided by this scientific prodigy.

SIN represents and serves UK science and innovation interests overseas and is jointly owned by the Department for Business, Innovation and Skills and the Foreign and Commonwealth Office. The network comprises of 90 officers based in 25 countries of key scientific interest, and works on behalf of Government Departments, Research Councils, Universities, charities and industry. To find out more, please visit: www.bis.gov.uk/sin. Any readers interested in finding out more about opportunities in Southeast Asia are invited to contact Sam Myers at: sam.myers@fco.gov.uk

HOUSE OF COMMONS SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

The Science and Technology Committee is established under Standing Order No 152, and 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.

At the Dissolution of Parliament the Members of the Science and Technology Committee were:

Dr Roberta Blackman-Woods (Lab, City of Durham), Mr Tim Boswell (Con, Daventry), Mr Ian Cawsey (Lab, Brigg and Goole), Mrs Nadine Dorries (Con, Mid Bedfordshire), Dr Evan Harris (Lib Dem, Oxford West and Abingdon), Dr Brian Iddon (Lab, Bolton South East), Mr Gordon Marsden (Lab, Blackpool South), Dr Doug Naysmith (Lab, Bristol North West), Dr Bob Spink (Independent, Castle Point), Ian Stewart (Lab, Eccles), Graham Stringer (Lab, Manchester, Blackley), Dr Desmond Turner (Lab, Brighton Kemptown), Mr Rob Wilson (Con, Reading East) and Mr Phil Willis (Lib Dem, Harrogate and Knaresborough). Mr Willis was elected Chairman of the Innovation, Universities, Science and Skills Committee at its first meeting on 14 November 2007 and continued as Chairman of the Science and Technology Committee from 1 October 2009.

ORAL EVIDENCE

The transcripts of these evidence sessions are available on the Science and Technology Committee's website.

On 24 March 2010, the Committee held an oral evidence session with Lord Drayson, Minister for Science and Innovation, and Professor John Beddington, the Government Chief Scientific Adviser. The first half of the session was a 'Science Question Time', the second half being on the Government's review of the principles applying to the treatment of independent scientific advice provided to government.

CURRENT INQUIRIES

If re-established in the new Parliament, the Committee will decide upon a programme of inquiries in the usual manner.

REPORTS

Evidence Check 2: Homeopathy

On 22 February 2010, the Committee published its Fourth Report of Session 2009-10, *Evidence Check 2: Homeopathy,* HC 45.

The Regulation of Geoengineering

On 18 March 2010, the Committee published its Fifth Report of Session 2009-10, *The Regulation of Geoengineering,* HC 221.

In a first for a select committee, the Chairman of the Committee gave evidence to the US House of Representatives Committee on Science and Technology on domestic and international governance of geoengineering via videolink shortly after publication of the Committee's report.

The impact of spending cuts on science and scientific research

On 23 March 2010, the Committee published its Sixth Report of Session 2009-10, *The impact of spending cuts on science and scientific research,* HC 335-I.

Bioengineering

On 25 March 2010, the Committee published its Seventh Report of Session 2009-10, Bioengineering, HC 220.

The disclosure of climate data from the Climatic Research Unit at the University of East Anglia

On 31 March 2010, the Committee published its Eighth Report of Session 2009-10, The disclosure of climate data from the Climatic Research Unit at the University of East Anglia, HC 387-I.

The Legacy Report

On 31 March 2010, the Committee published its Ninth and final Report of Session 2009-10, *The Legacy Report,* HC 481.

GOVERNMENT RESPONSES

The Government's review of the principles applying to the treatment of independent scientific advice provided to government: Government response to the Committee's Third Report of Session 2009-10

On 2 March 2010, the Committee published the Government's Response to its Report on *The Government's review of the principles applying to the treatment of independent scientific advice provided to government,* HC 384.

Evidence Check 1: Early Literacy Interventions: Government response to the Committee's Second Report of Session 2009-10

On 4 March 2010, the Committee published the Government's Response to its Report on *Evidence Check 1: Early Literacy Interventions,* HC 385.

Responses to Reports not received by the time of Dissolution are expected to be published by Command Paper, or by Special Report after the election.

FURTHER INFORMATION

Further information about the work of the Science and Technology Committee or its current inquiries can be obtained from the Clerk of the Committee, Glenn McKee, the Second Clerk, Richard Ward, or from the Senior Committee Assistant, Andy Boyd, on 020 7219 8367/2792/2794 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 emailed 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 strongly recommended to obtain a copy of the guidance note first. Guidance on the submission of evidence can be found at http://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.

HOUSE OF LORDS SCIENCE AND TECHNOLOGY SELECT COMMITTEE

The members of the Committee for session 2009-10 were Lord Broers, Lord Colwyn, Lord Crickhowell, Lord Cunningham of Felling, Lord Haskel, Lord Krebs, Lord May of Oxford, Lord Methuen, Baroness Neuberger, Earl of Northesk (who sadly died on 28 March 2010), Baroness Perry of Southwark, Lord O'Neill of Clackmannan, Lord Sutherland of Houndwood (Chairman) and Lord Warner. Baroness O'Neill of Bengarve and Lord Mitchell were co-opted to Sub-Committee I for the purposes of its inquiry into nanotechnologies and food; Lord Oxburgh was co-opted to the Select Committee for the purposes of its inquiry into setting science and technology research funding priorities; and Lord Jenkin, Lord Oxburgh and Lord Tombs were co-opted to a re-constituted Sub-Committee I for the purposes of a short inquiry into radioactive waste management. The Committee, along with all other Lords Select Committees, ceased to exist on the dissolution of Parliament and will therefore be subject to re-appointment in the next session.

SETTING PRIORITIES FOR PUBLICLY FUNDED RESEARCH

An inquiry into the setting of science and technology research funding priorities was launched in July 2009. The inquiry was undertaken by the Select Committee under the chairmanship of Lord Sutherland.

Cuts in overall public spending due to the current economic climate will lead to some difficult decisions about how to allocate public funds for science and technology research. Effective mechanisms for allocating funds are vital if the United Kingdom science base is to remain healthy, both now and in the future, and is able to continue to meet societal needs. The Committee investigated a range of issues including how decisions about funding research are made across Government and within Government departments and other public bodies, whether the balance between funding for targeted research and unsolicited response-mode curiosity-driven research is appropriate, and how research is commissioned.

The Committee published a Call for Evidence on 31 July 2009. The consultation period closed on 25 September. A seminar with key experts and relevant stakeholders was held on 14 October and oral evidence sessions were held from 28 October to 4 February 2010 when the Committee heard evidence from the Lord Drayson, Minister for Science and Innovation, and Professor Adrian Smith, Director General for Science and Research at the Department for Business, Innovation and Skills. The Committee published its report on 1 April 2010. Once the Government response has been published, the report will be debated in the House. The debate is likely to take place during the next session of Parliament.

RADIOACTIVE WASTE MANAGEMENT: A FURTHER UPDATE

The Select Committee appointed a Sub-Committee to conduct a short follow-up inquiry into the management of radioactive waste, following the Committee's previous reports on the subject, the last of which was published in session 2006-07.

The inquiry focused on the role and performance of the Committee on Radioactive Waste Management (CoRWM) which provides independent scrutiny and advice on the implementation of the Government's Managing Radioactive Waste Safely programme. The Committee held a one-off evidence session with representatives from CoRWM, Lord Hunt, Minister of State for Energy and Climate Change, and representatives from the Department of Energy and Climate Change and the Nuclear Decommissioning Authority in February 2010, and published its report on 25 March 2010. It is anticipated that the report will be debated by the House during the next session.

GENOMIC MEDICINE

During session 2007-08, the Select Committee appointed a Sub-Committee, chaired by Lord Patel, to hold an inquiry into genomic medicine. The Committee's report was published on the 6 July 2009 and the Government response was published in December.

The inquiry examined the policy framework in genomic medicine, the latest research and scientific developments, translation opportunities into the clinic, genomic databases and the use of genetic information in a healthcare setting. The Sub-Committee took evidence from a wide range of witnesses. They included the Medical Research Council, the Department of Health, the Wellcome Trust, Cancer Research UK, the Royal College of

Physicians, the National Institute for Health and Clinical Excellence, and representatives of the pharmaceutical and insurance industries. In early June 2008, members visited the National Human Genome Research Institute in Washington DC, where they spoke to experts in fields including population genomics, ethics, and translational research. They also met representatives from other organisations including the Food and Drug Administration, Harvard Medical School, and the American Society of Human Genetics.

The report is likely to be debated in the House early in the next session of Parliament.

NANOTECHNOLOGIES AND FOOD

Following a seminar in November 2008, the Select Committee appointed a Sub-Committee to investigate nanotechnologies and food under the chairmanship of Lord Krebs. A Call for Evidence was published on 3 February 2009 with a deadline for submissions of 13 March 2009.

The inquiry covered food products, additives and supplements, food contact materials, food manufacturing processes, animal feed, and pesticides and fertilisers. It investigated the use of nanotechnologies in the food sector focusing on the state of the science and its use in the food sector, health and safety, the regulatory framework, and public engagement and consumer information.

The Committee held its first public evidence session on 31 March 2009 with representatives from Government departments. Evidence was received from a wide variety of witnesses from within the food industry, consumers groups and academia. The Committee also visited Washington DC in late June, where members met United States government agencies, including the Food and Drug Administration and the Environmental Protection Agency; non-governmental organisations such as the Woodrow Wilson Centre; and industry representatives such as the Grocery Manufacturers Association. The Committee published its report on 8 January 2010. The Government published their response in March and it is expected that the report will be debated in the House early in the new session.

THE PROVISION OF SCIENCE ADVICE

On 2 February 2010 the Committee held a seminar, attended by key stakeholders, on the provision of independent advice by scientific advisory committees to Government. As a result of the concerns expressed at the seminar, the Chairman, on behalf of the Committee wrote to Lord Drayson, proposing the inclusion of a short provision in the Ministerial Code to ensure that Ministers develop an appropriate understanding of the nature of the relationship between independent scientific advisory committees and Government. A further letter, following up this point, was sent by the Chairman to Lord Drayson and Professor John Beddington, Government Chief Scientific Adviser, immediately before the dissolution of Parliament. The correspondence is available on the Committee's website (see below).

FURTHER INFORMATION

The 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 www.parliament.uk/hlscience. Further information about the work of the Committee can be obtained from Christine Salmon Percival, Committee Clerk, salmonc@parliament.uk or 020 7219 6072. The Committee's email address is hlscience@parliament.uk.

PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY (POST)

RECENT POST PUBLICATIONS

Climate Change: Engagement and Behaviour
January 2010 *POSTnote 347*

Public engagement plays an important role in UK climate policy, and is often used to promote lower carbon lifestyles or build support for policies. It can also involve the public in the design and implementation of policy on climate change. This note provides an overview of UK attitudes and behaviour relating to climate change. It outlines current engagement approaches and lessons for future policy.

Insect Pollination
January 2010 *POSTnote 348*

Many plants, including crops, depend on insects to transfer pollen between flowers. Maintaining enough insect pollinators is therefore vital for biodiversity and a diverse food supply. Declines in pollinators, particularly in Europe and the USA, have provoked claims of a global pollination crisis. This POSTnote examines the risks of pollinator decline for the UK and explores strategies to provide stable pollination services into the future.

Diagnosing Dementia
January 2010 *POSTnote 349*

Dementia currently affects 700,000 people in the UK, yet only 1 in 3 cases receives a formal diagnosis from a doctor. Dementia costs the UK economy £17bn a year and is one of the main causes of disability in later life. A key aim of the

Department of Health's 2009 National Dementia Strategy is early diagnosis. This is intended to improve quality of life through increased support, prevention of harm and reduction in care home admissions. This briefing outlines current diagnostic practices, research into newer tools and service provision proposals that aim to increase early diagnosis.

Pets, Families and Interagency Working

January 2010 *POSTnote 350*

All agencies, professions and individuals who have contact with children have a duty to safeguard them. Government guidance has highlighted the need for agencies to work together and share information to achieve this aim. It has been suggested that organisations that work with animals should be included in the safeguarding agenda on the basis that there may be an association between cruelty to animals and family violence. This POSTnote examines the evidence base for this assumption, and the rationale for cross-reporting between different agencies.

Lighting Technology

January 2010 *POSTnote 351*

Electric lighting accounts for around one-fifth of electricity consumption, both in the UK and globally. Under recent legislation, the traditional incandescent lamp is being phased out in the UK, saving 1 million tonnes of carbon dioxide a year by 2020 (equivalent to the emissions of around 180,000 households today). This POSTnote gives an overview of energy efficient lighting currently available and under development. It examines policy initiatives to drive uptake, as well as relevant health, environmental, public perception and economic issues.

Counterfeit Medicines

January 2010 *POSTnote 352*

Counterfeiting of medicines is increasing, is often linked to other criminal activities and poses risks to public health. It exposes people to medicines of unverified quality, safety and efficacy. This POSTnote considers the extent of the global counterfeit medicine trade, its impact in the UK and the technologies and policy options available to combat it. It also examines the risks and benefits of online pharmacy, one of the main ways in which counterfeits are distributed.

Renewable Heating

March 2010 *POSTnote 353*

Heating accounts for almost 50% of UK energy consumption and associated carbon dioxide emissions. Renewable heating technologies could therefore make a significant contribution towards carbon reduction and renewable energy targets. This POSTnote examines the available resources and technologies for supplying renewable heating and cooling in the UK and the policy options that could support their take up. This briefing does not consider insulation or changes in consumer behaviour that can affect the overall demand for heat.

Global Carbon Trading

March 2010 *POSTnote 354*

The EU has a target of reducing overall greenhouse gas emissions to at least 20% below 1990 levels by 2020. To assist in achieving this legally binding goal and delivering emissions reductions at reduced economic cost, the EU Emission Trading System started in 2005, creating mandatory carbon trading within the EU. This POSTnote looks at the EU trading system's mechanisms, comparing it with operational and proposed emissions trading systems elsewhere. Prospects of linking these to form an international system, and the alternatives, are also discussed.

Space Debris

March 2010 *POSTnote 355*

Space debris consists of millions of pieces of man-made material orbiting the Earth. Debris poses a growing threat to satellites and could prevent the use of valuable orbits in the future. Many pieces of debris are too small to monitor but too large to shield satellites against. This POSTnote looks at measures to protect satellites and international agreements and guidelines to reduce the amount of debris generated. In the long term, experts agree that it will be necessary to remove debris from orbit, but this is technically and politically challenging.

CURRENT WORK

Biological Sciences – Assisted Reproduction, Deception Detection Technologies and Behavioural Addictions

Environment and Energy – Security of Energy Supply, Biochar, Future Electricity Transmission, Ecosystem-based management of fisheries and Environmental Limits

Physical sciences and IT –Digital Preservation, Disruption of the Internet, Space Weather and Solar Technologies

Science Policy – EU Science and Technology Funding

CONFERENCES AND SEMINARS

Behavioural Economics

In March Lord Oxburgh hosted a seminar exploring the links between the economy and human psychology. Research in behavioural economics highlights how cognitive and social factors can determine our fiscal behaviour. This seminar featured presentations from leading economists and psychologists who highlighted how policymaking – from tackling consumer debt to incentivising saving for retirement – could take account of the human aspects of financial decision making.

This event followed recent work on the subject – a briefing on Delaying gratification and a podcast on short-term thinking featuring an interview with Dr Vince Cable MP.

Robotic Visions: Young People's Views on the Future of Robotics Technology

In March this event provided an opportunity for parliamentarians and other interested parties to understand public concerns about robotics research. Attendees heard how the Robotic Visions programme has brought together young people and researchers to explore current and future robotics research.

Land Use Futures

In March the Parliamentary Office of Science and Technology hosted an event to give parliamentarians the opportunity to discuss the future demands on UK land. Factors such as demographic shifts and climate change will put increasing pressure on land use in the

future. Foresight's project "Land Use Futures" covers issues from flooding to tranpsort, and explores a vision for land use for the next 50 years. Parliamentarians discussed the key findings of the report with the Head of Foresight, Professor Sandy Thomas and the project team.

Insect Pollination: Causes and Consequences of Decline

In January POST collaborated with the British Ecological Society to host a seminar following POST's January 2010 briefing note on Insect Pollination (POSTnote 348). Pollination is the transfer of pollen from one flower to another, enabling plant reproduction. Pollination by insects is therefore vital for the maintenance of biodiversity and agricultural production. 80% of British wildflowers and 84% of EU crops depend on insect pollinators, mainly bees. Loss of pollinators would cost UK agriculture an estimated £400m per annum, representing 12% of agricultural revenue. Evidence is mounting that British bee species, such as honeybees and bumblebees, are in decline, which could threaten future agricultural productivity and cause further biodiversity loss. What is causing this decline, and is further action needed to restore our pollinators?. We heard from expert speakers on the scientific and practical aspects of maintaining a healthy pollinator population and discussed such topics as:

- Does pollinator decline pose a significant threat to the UK?
- What research do we need to understand pollinator decline and mitigate its effects?
- What can we do to improve the health of managed honeybees?
- What policies do we need to maintain wild pollinators in the landscape despite increasing demands on land for housing, fuel and food?

WORK FOR SELECT COMMITTEES

House of Commons

Environmental Audit: Dr Jonathan Wentworth provided advice on a closed session on climate change science.

Environment, Food and Rural Affairs: Dr Wentworth provided advice on an oral evidence seminar on Defra's Evidence Investment Strategy 2010-2013.

Energy and Climate Change: Dr Michael O'Brien proof read the 'Future of UK Electricity Networks' report.

Health: Dr Sarah Bunn provided a written briefing for the Committee's one-off session on Overseas Doctors' Credentials.

North West Regional Committee: Dr Michael O'Brien provided a briefing on the future of the nuclear industry inquiry.

Transport: Dr Martin Griffiths provided an updated briefing on aviation noise fore the committee's consideration of the government response to its inquiry on the Future of Aviation.

Welsh Affairs: Dr Griffiths assisted the committee with a briefing for a one-off evidence session on broadband access in Wales.

International Development Committee: Dr Chandrika Nath provided a briefing on Climate Change in Nepal for the inquiry on DfID's Programme in Nepal.

House of Lords

Communications: Dr Griffiths provided assistance to the committee in drafting its report on the Digital Switchover.

STAFF, FELLOWS AND INTERNS AT POST

David Ferguson, from Oxford University, a fellow supported by Natural Environment Research Council, began working with the House of Commons Science and Technology Committee.

Conventional Fellows

Jo Church, Delft Institute Technology, National Endowment for Science, Technology and the Arts Fellowship

Joanna Foden, University of East Anglia, Natural Environment Research Council Fellowship

Barbara Ferriera, Cambridge University

Vera Matser, York University, POST Open Fellowship

Swati Nettleship, Leicester University, Natural Environment Research Council Fellowship

Paul Ouma, Parliament of Uganda, Commonwealth Professional Fellowship

Scott Vrecko, London School of Economics, Wellcome Trust Bioethics

Marc Warner, University College London

INTERNATIONAL ACTIVITIES

In March the Director made a keynote presentation to the Japanese vice-Minister for Science and members and officials of the Japanese Parliament at a special seminar on '3rd Generation Technology Assessment', held in Tokyo. The mission was supported by Tokyo University which was reporting on a three year study on the subject. On the same mission the Director also made a guest presentation on the work of the European Parliamentary Technology Assessment network at the first Asia-Europe Physics Summit, held at Tsukuba Science City in Japan.

POST AFRICAN PARLIAMENTS PROGRAMME

In Uganda the second round of MP-scientist pairing, in collaboration with the Ugandan National Academy of Sciences, took place at the end of March. There were 16 MP-scientist pairs, funded not only by the POST project but also by the Royal Society, the Wellcome Trust and the US National Academy of Sciences. At the end of the scheme, an evaluation seminar was attended by around 50 people.

Dr Newman is organising a training course on "Summarising Skills" in the Parliament of Uganda in June 2010. Funded by POST and the International Network for the Availability of Scientific Publications (INASP), this builds on earlier training courses on information literacy and on communication skills. It will focus on helping parliamentary staff interpret policy documents on climate change.

HOUSE OF COMMONS LIBRARY SCIENCE AND ENVIRONMENT SECTION

Information and copies of papers can be obtained from Michael Crawford at the House of Commons Library on 0207 219 6788 or through http://www.parliament.uk/parliamentary_publications_and_archives/research_papers.cfm

The following are summaries of papers introduced for Members of Parliament.

Energy Bill: Committee Stage Report

Research Paper 10/14

This paper summarises the House of Commons Second Reading and Committee Stage proceedings of the Energy Bill. It supplements Research Paper 09/88 which describes the background content of the Bill in detail. The Bill was not amended in Committee.

The Bill is divided into three main parts. The first part would introduce a carbon capture and storage (CCS) financial assistance scheme to support the construction of up to four UK CCS demonstration projects, to be chosen in a competition. The second part relates to schemes for reducing fuel poverty; it would introduce mandatory social price support, designed to lower energy bills for the most vulnerable, which would replace the current voluntary agreement which expires in 2011. The third part relates to the regulation of gas and electricity markets: it would make clear explicitly what Ofgem should include in its assessment of how to protect energy consumers; it would make it easier for Ofgem to tackle exploitation of market power by electricity generation companies in specified situations; and it would increase Ofgem's power to fine companies.

The Bill received Royal Assent on 8 April 2010.

Grocery Market Ombudsman Bill

Research Paper 10/21

The Bill was a Private Member's Bill introduced by Albert Owen MP. The Bill would have established an independent ombudsman for the grocery market to oversee the operation of the Groceries Supply Code of Practice.

The Bill did not pass through all its parliamentary stages before the dissolution of Parliament.

LETTER TO THE EDITOR

SET for Britain 2010 – a young researcher's perspective

As I was standing in line for security checks before entering the Houses of Parliament, I was immediately struck by two observations. Firstly, I was not going to be the only young researcher with an interdisciplinary poster. If the chats I had in the queue were anything to go by, quite a few of us were applying methods from the physical sciences to topics as varied as linguistics, climate research and, in my case, neuroscience. With one of the stated aims of SET for Britain being to "Foster greater interaction and networking between researchers especially between those from different scientific and technological backgrounds…" the event was almost certainly going to be a success.

The second, less encouraging sign was the bemused and sometimes amused expression of the security staff when we explained that we were scientists and revealed the contents of our suspicious-looking poster tubes. If, over the last decade or two, enormous strides have been taken to understand and exploit the overlaps between different areas of scientific enquiry, the same case for eroding the silos between science and other areas of human endeavour such as governance remains largely to be made. Yet science has the potential to deeply change every facet of the world we live in, as evidenced by the high profile ethical and political questions surrounding climate change, nanotechnology, nuclear power, biotechnology and the threat of pandemics. With this in mind, I couldn't wait to get inside and meet the people who understand the need for and are in a position to promote the interaction between science and other disciplines, in parliament as well as in society at large.

My aim in attending SET for Britain was to engage with policy makers and I hoped that my poster would offer a good starting point. Firstly, of course, I was hoping to convey the excitement of working in the field of neuroscience and grappling with one of the greatest unsolved mysteries in science – How does the brain work? Secondly, I was hoping to show how such fundamental research can rapidly and unexpectedly develop into an applied project with potentially huge societal impact. In my case, a chance observation based on my theoretical model of perception has recently lead me to begin working on Schizophrenia, a complex disease touching some 1% of the British population. Lastly, I was hoping to highlight the pertinence of basic neuroscientific research to seemingly unrelated areas such as the criminal justice system. Indeed, as the Nobel laureate Christian de Duve wrote in his 1995 book, Vital Dust: "If … neuronal events in the brain determine behaviour irrespective of whether they are conscious or unconscious, it is hard to find room for free will. But if free will does not exist, there can be no responsibility, and the structure of human societies must be revised."

How successful, then, was my first attempt to cross the silos? I would say the event on the one hand surpassed my expectations and on the other, left me slightly disappointed. Indeed, I could hardly have wished for more than the meaningful contact I have formed with one of the visitors, discussing issues at the interface of science and policy both at the event and subsequently via e-mail. Having had such a positive experience, however, I cannot help but wonder how fruitful the event might have been if it had been more heavily attended. To be concrete, apart from the judges, I only spoke to two visitors during the entire session, and many of the neighbouring researchers had even less luck.

All in all, SET for Britain 2010 was a wonderful experience and I hope that it will keep growing in following years, attracting more visitors, whether parliamentarians or other stakeholders. Although this event can serve as a starting point for conversation between policymakers and scientists, it remains a real challenge to make such interaction more fluid and commonplace. It often seems that scientists only remember the importance of policy when their funding happens to be cut and are otherwise little involved in issues such as science education or the regulation of scientific research based on risk-benefit analyses and ethical concerns. This is not so surprising given that there is nothing in the structure of universities, in the academic curricula or in the measures used to assess a scientist's contribution to society that encourages a wider involvement in policy. The catch is that this lack of incentive itself needs to be tackled jointly by policy makers and the scientific community.

Petra Vertes, Cambridge University

EURO-NEWS

Commentary on science and technology within the European Parliament and the Commission

UK Research Office in Brussels celebrated its 25th anniversary in March 2010

The UK Research Office (UKRO), - the European office of the UK Research Councils - which is managed by the Biotechnology and Biological Sciences Research Council (BBSRC) on behalf of Research Councils UK (RCUK), was established at the beginning of the first EU research Framework Programme to provide a direct point of liaison with EU institutions and to provide insight, information and guidance on EU policies and programmes. Dr Amanda Crowfoot, Director of UKRO said: "It is wonderful to be celebrating 25 years of UKRO's work. We aim to ensure that UK researchers are fully engaged with EU research, innovation and higher education programmes and it is tremendously rewarding to know that the UK is now one of the most successful countries in the EU Framework Programme for Research and Technological Development."

In Framework Programme 6 the UK was involved in over 45% of successful proposals and received 14% of the funding - a trend that is continuing into Framework Programme 7 (FP7) with the UK taking the largest proportion of funding in 2008.

The European Research Council (ERC) has been introduced in FP7 and UKRO became the UK National Contact Point for those applying to ERC. In the 2009 'Starting Grant' call around 18% of all successful proposals were hosted by UK institutions and for 'Advanced Grants', the figure is around 25%. BBSRC has been managing partner of UKRO for almost 20 years and is involved with a number of UK contributions to the European Research Area.

Science and political will: An interview with Euroscience president Dr Enric Banda

Dr Enric Banda, a geophysicist and president of the 2,100-member-strong grassroots organisation Euroscience, spoke with CORDIS News about the importance of young scientists, the impact of economic crises on scientific careers and the challenge of building a strong science and technology base in Europe.

Euroscience is an 11-year-old organisation that gives a voice to scientists at the European level. "It's an organisation of individuals, not institutions," explained Dr Banda. One of the many purposes of the organisation, he said, is influencing and orienting the political world; however, this can be an uphill battle. "The political world is certainly deaf to scientists and people interested in science," he said. "Politicians talk about science and technology and forget about it a minute later."

"Science is inevitably a protagonist in the public world," he said, adding that Euroscience really works to foster a strong science and technology base for Europe. "This is our ideal, and this is what we work for. And one of the ways we do it is through young scientists" Euroscience strives to help young scientists by offering guidance and encouraging them to follow careers in science, wherever opportunities might present themselves in Europe. The current economic crisis is certainly bound to have an impact on those just starting their careers, Dr Banda said, but expressed hope that the fundamental need for business to innovate will likely soften the blow.

"Unfortunately, I do believe that there will be some damage done to the science world in terms of public money getting into science," he said. "Crises normally mean cutting budgets, and science is an easy place, from a political point of view, to make cuts." But this financial crisis will not last forever, he added. "One cannot work on the basis of, "there is a financial crisis, I will not be able to get a job"; you may be hit by the crisis, and it might take you longer to find a job, but you will find a job," he noted.

"In the business world, I am not sure that the innovation part of the companies will suffer a lot because they do understand that that's the way out of the crisis. So altogether I'm not that pessimistic," he added. "If we turn to the private, industrial, services worlds, knowledge is also the best way to compete these days. So I cannot really believe that people think that by getting deeper into a career they will get into a "no job" situation."

According to Dr Banda, universities tell a different story. Because competition is fiercer than ever, achieving a full professorship, even after a long career, is not a fait accompli for those choosing to stay in academia. "We still have problems, and still have difficulty getting visas for scientists who are not European. So mobility is still a problem in Europe that I hope we can fight," said Dr Banda. Regarding the recently announced roadmap for European research infrastructures as set out by the European Strategy Forum on Research Infrastructures (ESFRI), Dr Banda is optimistic. "It's high time Europe had a roadmap for what the infrastructures of the future should be, and I believe ESFRI has been successful in that."

SCIENCE DIRECTORY

DIRECTORY INDEX

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Institution of Engineering and Technology
National Physical Laboratory
STFC

Intellectual Property
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C-Tech Innovation
Eli Lilly and Company Ltd
NESTA

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C-Tech Innovation
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National Physical Laboratory
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STFC

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UFAW

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Prospect
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Public Understanding of Science
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LGC
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AMSI
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Kew Gardens
Natural England

Statistics
EPSRC
Engineering UK
Royal Statistical Society

Surface Science
C-Tech Innovation
STFC

Sustainability
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CABI
C-Tech Innovation
EPSRC
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The Linnean Society of London
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Society of Biology

Technology Transfer
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LGC
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Tropical Medicine
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Viruses
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Water
AMSI
C-Tech Innovation
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Society for General Microbiology
Society for Applied Microbiology
Society of Biology

Wildlife
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The Food and Environment Research Agency
The Linnean Society of London
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Natural History Museum
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Research Councils UK

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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.

Arts and Humanities Research Council

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Each year the AHRC provides approximately £105 million from the Government to support 700 research awards and around 1,350 postgraduate awards in the arts and humanities, from archaeology and English literature to dance and design. Awards are made after a rigorous peer review process, so that only applications of the highest quality are funded. The quality and range of research supported by this investment of public funds not only provides social and cultural benefits but also contributes to the economic success of the UK.

Biotechnology and Biological Sciences Research Council (BBSRC)

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BBSRC is the UK's principal public funder of research and research training across the biosciences. BBSRC provides institute strategic research grants to eight centres, as well as supporting research and training in universities across the UK. BBSRC's research underpins advances in a wide range of bio-based industries, and contributes knowledge to policy areas which include: food security, climate change, diet and health and healthy ageing.

Economic and Social Research Council

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The ESRC is the UK's leading research and training agency addressing economic and social concerns. We pursue excellence in social science research; work to increase the impact of our research on policy and practice; and provide trained social scientists who meet the needs of users and beneficiaries, thereby contributing to the economic competitiveness of the United Kingdom, the effectiveness of public services and policy, and quality of life. The ESRC is independent, established by Royal Charter in 1965, and funded mainly by government.

EPSRC

Engineering and Physical Sciences Research Council

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EPSRC is the main UK government agency for funding research and training in engineering and the physical sciences, investing around £850 million a year in a broad range of subjects – from mathematics to materials science, and information technology to structural engineering.

EPSRC's investment in high quality basic, strategic and applied research and training promotes future economic and societal impact in the UK.

Medical Research Council

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For almost 100 years the Medical Research Council (MRC) has improved the health of people in the UK and around the world by supporting the highest quality science.

The MRC is funded by the UK taxpayer. We are independent of Government, but work closely with the Health Departments, the National Health Service and industry to ensure that the research we support takes account of the public's needs as well as being of excellent scientific quality. As a result, MRC-funded research has led to some of the most significant discoveries in medical science and benefited millions of people, both in the UK and worldwide.

Natural Environment Research Council

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The UK's Natural Environment Research Council funds and carries out impartial scientific research in the sciences of the environment. NERC trains the next generation of independent environmental scientists.

NERC funds research in universities and in a network of its own centres, which include:

British Antarctic Survey, British Geological Survey, Centre for Ecology and Hydrology, and National Oceanography Centre.

Science & Technology Facilities Council

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Formed by Royal Charter in 2007, the Science and Technology Facilities Council is one of Europe's largest multidisciplinary research organisations supporting scientists and engineers world-wide. The Council operates world-class, large-scale research facilities and provides strategic advice to the UK Government on their development. The STFC partners in the UK's two National Science and Innovation Campuses. It also manages international research projects in support of a broad cross-section of the UK research community. The Council directs, co-ordinates and funds research, education and training.

The Academy of Medical Sciences

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The Academy of Medical Sciences promotes advances in medical science and campaigns to ensure these are converted into healthcare benefits for society. The Academy's Fellows are the United Kingdom's leading medical scientists and scholars from hospitals, academia, industry and the public service. The Academy provides independent, authoritative advice on public policy issues in medical science and healthcare.

The Association for Science Education

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The Association for Science Education (ASE) is the largest subject association in the UK for teachers, technicians and others interested in science education. Working closely with the science professional bodies, industry and business, ASE provides a UK network bringing together individuals and organisations to share good ideas, tackle challenges in science teaching, develop resources and foster high quality continuing professional development.

Association of the British Pharmaceutical Industry

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The ABPI is the voice of the innovative pharmaceutical industry, working with Government, regulators and other stakeholders to promote a receptive environment for a strong and progressive industry in the UK, one capable of providing the best medicines to patients.

The ABPI's mission is to represent the pharmaceutical industry operating in the UK in a way that:

- assures patient access to the best available medicine;
- creates a favourable political and economic environment;
- encourages innovative research and development;
- affords fair commercial returns

AIRTO

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AIRTO represents the UK's independent research and technology sector - member organisations employ a combined staff of over 20,000 scientists and engineers with a turnover exceeding £2 billion. Work carried out by members includes research, consultancy, training and global information monitoring. AIRTO promotes their work by building closer links between members and industry, academia, UK government agencies and the European Union.

Association of Marine Scientific Industries

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The Association of Marine Scientific Industries (AMSI) is a constituent association of the Society of Maritime Industries (SMI) representing companies in the marine science and technology sector, otherwise known as the oceanology sector.

The marine science sector has an increasingly important role to play both in the UK and globally, particularly in relation to the environment, security and defence, resource exploitation, and leisure. AMSI represents manufacturers, researchers, and system suppliers providing a co-ordinated voice and enabling members to project their views and capabilities to a wide audience.

Biochemical Society

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The Biochemical Society exists to promote and support the Molecular and Cellular Biosciences. We have nearly 6000 members in the UK and abroad, mostly research bioscientists in Universities or in Industry. The Society is also a major scientific publisher. In addition, we promote Science Policy debate and provide resources, for teachers and pupils, to support the bioscience curriculum in schools. Our membership supports our mission by organizing scientific meetings, sustaining our publications through authorship and peer review and by supporting our educational and policy initiatives.

British Science Association

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Our vision is a society in which people are able to access science, engage with it and feel a sense of ownership about its direction. In such a society science advances with, and because of, the involvement and active support of the public.

Established in 1831, the British Science Association is a registered charity which organises major initiatives across the UK, including National Science and Engineering Week, the British Science Festival, programmes of regional and local events and the CREST programme for young people in schools and colleges. We provide opportunities for all ages to discuss, investigate, explore and challenge science.

The British Ecological Society

The British Ecological Society
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Ecology into Policy Blog
http://britishecologicalsociety.org/blog/

The British Ecological Society's mission is to advance ecology and make it count. The Society has 4,000 members worldwide. The BES publishes five internationally renowned scientific journals and organises the largest scientific meeting for ecologists in Europe. Through its grants, the BES also supports ecologists in developing countries and the provision of fieldwork in schools. The BES informs and advises Parliament and Government on ecological issues and welcomes requests for assistance from parliamentarians.

British Nutrition Foundation

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www.foodafactoflife.org.uk

The British Nutrition Foundation (BNF) was established over 40 years ago and exists to deliver authoritative, evidence-based information on food and nutrition in the context of health and lifestyle. The Foundation's work is conducted and communicated through a unique blend of nutrition science, education and media activities.

BRITISH PHARMACOLOGICAL SOCIETY

Today's science, tomorrow's medicines

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The British Pharmacological Society has now been supporting pharmacology and pharmacologists for over 75 years. Our 2,000+ members, from academia, industry and clinical practice, are trained to study drug action from the laboratory bench to the patient's bedside. Our aim is to improve the quality of life by developing new medicines to treat and prevent the diseases and conditions that affect millions of people and animals. Inquiries about drugs and how they work are welcome.

The British Psychological Society

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The British Psychological Society is an organisation of over 45,000 members governed by Royal Charter. It maintains the Register of Chartered Psychologists, publishes books, 10 primary science Journals and organises conferences. Requests for information about psychology and psychologists from parliamentarians are welcome.

British Society for Antimicrobial Chemotherapy

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Founded in 1971, and with 800 members worldwide, the Society exists to facilitate the acquisition and dissemination of knowledge in the field of antimicrobial chemotherapy. The BSAC publishes the *Journal of Antimicrobial Chemotherapy* (JAC), internationally renowned for its scientific excellence, undertakes a range of educational activities, awards grants for research and has active relationships with its peer groups and government.

CABI

www.cabi.org

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CABI is an international not for profit organization, specialising in scientific publishing, research and communication. Our mission is to improve peoples' lives worldwide by finding sustainable solutions to agricultural and environmental issues. Activities range from assisting national policy makers and informing worldwide research to supporting income poor farmers. We also house and manage the UK's National Collection of Fungus Cultures which we are exploring for potential new drugs, enzymes and nutraceuticals.

Cavendish Laboratory

UNIVERSITY OF CAMBRIDGE

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

Its world-class research is focused in a number of experimental and theoretical diverse fields.

Astrophysics: Millimetre astronomy, optical interferometry observations & instrumentation. Astrophysics, geometric algebra, maximum entropy, neutral networks.

High Energy Physics: LHC experiments. Detector development. Particle physics theory.

Condensed Matter Physics: Semiconductor physics, quantum effect devices, nanolithography. Superconductivity, magnetic thin films. Optoelectronics, conducting polymers. Biological Soft Systems. Polymers and Colloids. Surface physics, fracture, wear & erosion. Amorphous solids. Electron microscopy. Electronic structure theory & computation. Structural phase transitions, fractals, quantum Monte Carlo calculations Biological Physics. Quantum optics.

Chartered Institute of Patent Attorneys

Founded 1882 Royal Charter 1891

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CIPA's members practise in intellectual property, especially patents, trade marks, designs, and copyright, either in private partnerships or industrial companies. Through its new regulatory Board, CIPA maintains the statutory Register. It advises government and international circles on policy issues and provides information services, promoting the benefits to UK industry of obtaining IP protection, and to overseas industry of using British attorneys to obtain international protection.

Clifton Scientific Trust

CLIFTON SCIENTIFIC Trust

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We build grass-roots partnerships between school and the wider world of professional science and its applications

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C-Tech Innovation Limited

C-Tech Innovation
...advantage through technology

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Innovation Management and Technology Development organisation offering an end-to-end innovation management service, able to assist at every step of the innovation journey. We work with SMEs, Blue Chips, Central, Regional and Local Government. Our activities include research and development, engineering design as well as a wide ranging innovation, business and technology consultancy. See www.ctechinnovation.com for more details.

Eli Lilly and Company Ltd

Lilly
Answers That Matter.

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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, severe sepsis, depression, bipolar disorder, heart disease and many other diseases.

EngineeringUK

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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.

The Food and Environment Research Agency

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The Food and Environment Research Agency's over arching purpose is to support and develop a sustainable food chain, a healthy natural environment, and to protect the global community from biological and chemical risks.

Our role within that is to provide robust evidence, rigorous analysis and professional advice to Government, international organisations and the private sector.

Health Protection Agency

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The Health Protection Agency is an independent UK organisation that protects the public from threats to their health from infectious diseases and environmental hazards.

The HPA identifies and responds to health hazards and emergencies caused by infectious disease, hazardous chemicals, poisons or radiation.

It gives advice to the public, provides data and information to government, and advises people working in healthcare. It also makes sure the nation is ready for future threats to health that could happen naturally, accidentally or deliberately.

Human Fertilisation and Embryology Authority

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The HFEA is a non-departmental Government body that regulates and inspects all UK clinics providing IVF, donor insemination or the storage of eggs, sperm or embryos. The HFEA also licenses and monitors all human embryo research being conducted in the UK.

The Institute of Measurement and Control

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The Institute of Measurement and Control provides a forum for personal contact amongst practiioners, publishes learned papers and is a professional examining and qualifying organisation able to confer the titles EurIng, 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 scientific charity devoted to increasing the practice, understanding and application of physics. It has a worldwide membership of more than 36,000 and is a leading communicator of physics-related science to all audiences, from specialists through to government and the general public. Its publishing company, IOP Publishing, is a world leader in scientific publishing and the electronic dissemination of physics.

IPEM 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. It accredits medical physicists, clinical engineers and clinical technologists through its membership register, 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 and by the Engineering Council (UK) to award CEng, IEng and EngTech.

IChemE

Institution of Chemical Engineers

IChemE is the hub for chemical, biochemical and process engineering professionals worldwide. We are the heart of the process community, promoting competence and a commitment to sustainable development, advancing the discipline for the benefit of society and supporting the professional development of over 30,000 members.

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Institution of Civil Engineers

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ICE aims to be a leading voice in infrastructure issues. With over 80,000 members, ICE acts as a knowledge exchange for all aspects of civil engineering. As a Learned Society, the Institution provides expertise, in the form of reports, evidence and comment, on a wide range of subjects including infrastructure, energy generation and supply, climate change and sustainable development.

Institution of Engineering and Technology

Collective inspiration

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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 from 1871, the IET has 150,000 members in 127 countries with offices in Europe, North America and Asia-Pacific.

KEW GARDENS

Kew
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The mission of Kew is to inspire and deliver science-based plant conservation worldwide, enhancing the quality of life. Kew is developing its breathing planet programme with seven key strategies:

- creating global access to essential information
- identifying species and regions most at risk
- helping implement global conservation programmes
- extending the Millennium Seed Bank's global partnership
- establishing a global network for restoration ecology
- identifying and growing locally appropriate species in a changing climate
- using botanic gardens as shop-front opportunities to inform and inspire

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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 28 laboratories and centres across Europe and at sites in China, India and the US.

The Linnean Society of London

The Linnean Society of London
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The Linnean Society of London is the world's oldest active biological society. Founded in 1788, the Society takes its name from the Swedish naturalist Carl Linnaeus whose botanical, zoological and library collections have been in its keeping since 1829. The Society continues to play a central role in the documentation of the world's flora and fauna, recognising the continuing importance of such work to many scientific issues.

London Metropolitan Polymer Centre

LONDON metropolitan university

Sir John Cass Department of Art, Media & Design

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The London Metropolitan Polymer Centre provides training, consultancy and applied research to the UK polymer (plastics & rubber) industry. Recently, LMPC has merged with the Sir John Cass Department of Art, Media & Design (JCAMD) to provide a broad perspective of materials science and technology for the manufacturing and creative industries. JCAMD contains Met Works, a unique new Digital Manufacturing Centre, providing new technology for rapid prototyping and manufacture. The new department will offer short courses in polymer innovation, print technology and silversmithing & jewellery.

Marks & Spencer Plc

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Main Business Activities
Retailer – Clothing, Food, Home and Financial Services

We have over 600 UK stores, employing over 75,000 people - 285 stores internationally in 40 territories.

We are one of the UK's leading retailers, with over 21 million people visiting our stores each week. We offer stylish, high quality, great value Clothing and Home products, as well as outstanding quality foods, responsibly sourced from around 2,000 suppliers globally.

MERCK SHARP & DOHME

UK Subsidiary of Merck & Co., Inc

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Merck Sharp & Dohme Limited (MSD) is the UK subsidiary of Merck & Co., Inc., of Whitehouse Station, New Jersey, USA, a leading research-based pharmaceutical company that discovers, develops, manufactures and markets a wide range of innovative pharmaceutical products to improve human health. Our mission is to provide society with superior products and services by developing innovations and solutions that improve the quality of life.

The National Endowment for Science, Technology and the Arts

NESTA Making Innovation Flourish

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NESTA is the National Endowment for Science, Technology and the Arts – an independent organisation with a mission to make the UK more innovative. It operates in three main ways: by investing in early-stage companies; informing and shaping policy; and delivering practical programmes that inspire others to solve the big challenges of the future. NESTA's expertise in this field makes it uniquely qualified to understand how the application of innovative approaches can help the UK to tackle two of the biggest challenges it faces: the economic downturn and the radical reform of the public services.

National Physical Laboratory

NPL 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 England

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Natural England has the responsibility to enhance biodiversity, landscape and wildlife in rural, urban, coastal and marine areas; promote access, recreation and public well-being, and contribute to the way natural resources are managed so that they can be enjoyed now and by future generations. In delivering these responsibilities, we work with a range of partners to continue to develop the broad evidence base we need to underpin both our operational decisions and our advice to government and others.

Natural History Museum

The Science of Nature

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The Natural History Museum is the UK's premier institute for knowledge on the diversity of the natural world, conducting scientific research of global impact and renown. We maintain and develop the collections we care for and use them to promote the discovery, understanding, responsible use and enjoyment of the world around us.

The Nutrition Society

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Founded in 1941, The Nutrition Society is the premier scientific and professional body dedicated to advance the scientific study of nutrition and its application to the maintenance of human and animal health.

Highly regarded by the scientific community, the Society is the largest learned society for nutrition in Europe. Membership is worldwide and is open to those with a genuine interest in the science of human or animal nutrition.

Principal activities include:

1. Publishing internationally renowned scientific learned journals
2. Promoting the education and training of nutritionists
3. Promoting the highest standards of professional competence and practice in nutrition
4. Disseminating scientific information through its publications and programme of scientific meetings

PHARMAQ Ltd

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Veterinary pharmaceuticals specialising in aquatic veterinary products. Fish vaccines, anaesthetics, antibiotics and other products.

Plymouth Marine Sciences Partnership

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The Plymouth Marine Sciences Partnership comprises seven leading marine science and technology institutions, representing one of the largest regional clusters of expertise in marine sciences, education, engineering and technology in Europe. The mission of PMSP is to deliver world-class marine research and teaching, to advance knowledge, technology and understanding of the seas. PMSP research addresses the fundamental understanding of marine ecosystems and processes that must be applied in support and development of policy, marine and maritime industry and marine biotechnology.

Prospect

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Prospect is an independent, thriving and forward-looking trade union with 122,000 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.

The Royal Academy of Engineering

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Founded in 1976, The Royal Academy of Engineering promotes the engineering and technological welfare of the country. Our activities – led by the UK's most eminent engineers – develop the links between engineering, technology, and the quality of life. As a national academy, we provide impartial advice to Government; work to secure the next generation of engineers; and provide a voice for Britain's engineering community.

The Royal Institution

The Royal Institution of Great Britain

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www.rigb.org

The core activities of the Royal Institution centre around four main themes: science research, education, communication and heritage. It has a major Public Events Programme designed to connect people to the world of science, as well as a UK-wide Young People's Programme of science and mathematics enrichment activities. Internationally recognised research programmes in bio- and nanomagnetism take place in the Davy Faraday Research Laboratory. The building has recently undergone a £22 million refurbishment, and now features an extended museum, new social spaces and upgraded facilities in the historic lecture theatre.

The Royal Society

THE ROYAL SOCIETY
CELEBRATING 350 YEARS

Contact: Dr Peter Cotgreave
Director of Public Affairs
The Royal Society, 6-9 Carlton House Terrace
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Tel: 020 7451 2502 Fax: 020 7930 2170
Email: peter.cotgreave@royalsociety.org
Website: www.royalsociety.org

The Royal Society is the UK academy of science comprising 1400 outstanding individuals representing the sciences, engineering and medicine. As we celebrate our 350th anniversary in 2010,our strategic priorities for our work at national and international levels are to:

- Invest in future scientific leaders and in innovation
- Influence policymaking with the best scientific advice
- Invigorate science and mathematics education
- Increase access to the best science internationally
- Inspire an interest in the joy, wonder and excitement of scientific discovery.

The Royal Society of Chemistry

Contact: Dr Stephen Benn
Parliamentary Affairs
The Royal Society of Chemistry
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E-mail: benns@rsc.org or parliament@rsc.org
Website: http://www.rsc.org
http://www.chemsoc.org

The Royal Society of Chemistry is a learned, professional and scientific body of over 46,000 members with a duty under its Royal Charter "to serve the public interest". It is active in the areas of education and qualifications, science policy, publishing, Europe, information and internet services, media relations, public understanding of science, advice and assistance to Parliament and Government.

The Royal Statistical Society

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The Royal Statistical Society is a leading source of independent advice, comment and discussion on statistical issues. It promotes public understanding of statistics and acts as an advocate for the interests of statisticians and users of statistics. The Society actively contributes to government consultations, Royal Commissions, parliamentary select committee inquiries, and to the legislative process. In 2009, the RSS celebrated 175 years since its foundation in 1834.

Semta

the Sector Skills Council for Science, Engineering and Manufacturing Technologies

Contact: Customer Services
14 Upton Road
Watford
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E-mail: customerservices@semta.org.uk
Website: www.semta.org.uk

Semta's skills service for UK science, engineering and manufacturing employers

- Training needs assessment against a company's business objectives.
- Quality programmes from The National Skills Academy for Manufacturing
- A training management service.
- Access to available funding and accredited training providers.
- Research into training needs to influence governments' support for skills strategies

Society for Applied Microbiology

Contact: Philip Wheat
Society for Applied Microbiology
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Bedford MK41 7PH
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Website: www.sfam.org.uk

*Sf*AM is the oldest UK microbiological society and aims 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.

*Sf*AM is the voice of applied microbiology with members across the globe and works in partnership with sister organisations to exert influence on policy-makers world-wide.

Society for General Microbiology

Contact: Dariel Burdass
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Website: www.sgm.ac.uk

SGM is the largest microbiological society in Europe. The Society publishes four journals of international standing, and organises regular scientific meetings.

SGM also promotes education and careers in microbiology, and it is committed to represent microbiology to government, the media and the public.

An information service on microbiological issues concerning aspects of medicine, agriculture, food safety, biotechnology and the environment is available on request.

Society of Biology

Contact: Dr Mark Downs, Chief Executive
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London EC4A 3EF
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Website www.societyofbiology.org

The Society of Biology is a single unified voice for biology: advising Government and influencing policy; advancing education and professional development; supporting our members, and engaging and encouraging public interest in the life sciences. The Society represents a diverse membership of over 80,000 - including, students, practising scientists and interested non-professionals - as individuals, or through learned societies and other organisations.

Society of Cosmetic Scientists

Contact: Lorna Weston,
Secretary General
Society of Cosmetic Scientists
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Website: www.scs.org.uk

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.

Universities Federation for Animal Welfare

Contact: Dr James Kirkwood,
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Wheathampstead, Herts. AL4 8AN.
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Website: www.ufaw.org.uk
Registered in England Charity No: 207996

UFAW is an internationally-recognized independent scientific and educational animal welfare 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 leading journal Animal Welfare and other high-quality publications on animal care and welfare.
- providing expert advice to government departments and other concerned bodies.

A GUIDE TO SCIENCE IN PARLIAMENT

This insert in the Whit 2010 issue of Science in Parliament, is specially prepared by the Parliamentary and Scientific Committee for distribution at the outset of the new Parliament in May 2010.

It is published for the benefit of recently elected Members of Parliament and to help inform and update those who have been re-elected, and Members of the House of Lords. It provides an overview of activities related to Science, Engineering, Technology and Mathematics (STEM) undertaken in the Palace of Westminster. This will help them take decisions with support from scientists and engineers in their own interests and of the work of Parliament generally.

HOUSE OF COMMONS LIBRARY: SCIENCE AND ENVIRONMENT SECTION (SES)

This section provides a range of briefings for MPs:

- Confidential replies to individual enquiries, often provided to tight deadlines;
- Briefings for the Commons Second Reading and later stages of legislation available to all;
- Frequently updated online notes on a wide range of topics.

Our well-qualified staff of about ten people includes a medical doctor, science PhDs and librarians. Our briefings are always impartial and are tailored to provide material of use to busy MPs and their staff. We record the range of opinions on particular controversial issues, rather than trying to formulate our own conclusions. The Library as a whole aims to cover all topics of importance to MPs. Our section covers areas with a particular scientific and technological input – including energy policy, environmental policy, climate change, medicine, waste, water, agriculture and telecommunications. Our way of working means that we can produce briefings very rapidly when required, and we take pride in meeting any deadline – however short. We use mainly online sources but we also hold material related to policy areas, particularly showing how policies have developed over time.

Recent examples of our work included:

- Briefings on the Energy Bill, the Digital Economy Bill, the Flood and Water Management Bill and the Copenhagen Conference on Climate Change
- Nearly 2000 logged individual enquiries in the 2009/10 financial year, almost all with written answers, along with numerous quick telephone replies;
- Around 300 online notes, updated whenever necessary;
- Talks for research assistants to help them with answering constituency enquiries.

Christopher Barclay
Head of SES
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HOUSE OF COMMONS SCIENCE AND TECHNOLOGY COMMITTEE

Glenn McKee
Clerk of the Committee, Committee Office
House of Commons
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The Science and Technology Committee was re-established in October 2009, its previous incarnation having been wound up in 2007 and replaced by the Innovation, Universities, Science and Skills Committee for 2007 to 2009. The Science and Technology Committee is established under Standing Order No. 152, and 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 Committee has interpreted this remit to examine the full scope of science policy and related matters across government.

At the time of writing, the Standing Order prescribes that the Science and Technology Committee should have fourteen Members. Members are nominated by the Committee of Selection and appointed by the House for the duration of the Parliament (though there is often some membership change each Session). Places on the Committee are divided in proportion to party representation in the House of Commons. The Committee elects one of its members as Chair. Reforms agreed by the House of Commons before the election will in future provide for the election of Select Committee Chairs by the House, as well as a return to a membership of eleven.

The *modus operandi* most often employed by Select Committees is an inquiry. Select Committees decide upon a topic of inquiry, take evidence, both written and oral, and report their findings to the House. As a general principle, reports must rest on evidence, and the evidence is published. It is for the Committee members to decide upon the inquiries they will undertake, and the evidence they require. Inquiries can be very varied,

both in topic and length. Some reports may rest on written evidence alone, others on extensive oral hearings, as well as written evidence. Oral evidence is normally taken in public, is 'webcast' and may later be televised. On occasion, the Committee may publish the evidence without any report as a means of placing matters on record. The Committee may also make visits in connection with its inquiries.

The Committee's reports are followed by a response from the Government, normally published as a Special Report from the Committee, other times as a Government document published "by Command of Her Majesty". If dissatisfied with the response, or to establish what progress has been made, the Committee may issue a follow-up report or conduct a short follow-up inquiry. On occasion, committee reports are debated either on the floor of the House or in the "parallel Chamber" of Westminster Hall.

Since its reincarnation last year, the Committee has published nine reports on subjects as varied as bioengineering and the principles applying to the treatment of independent scientific advice provided to government. The Committee also inherited a programme of "Evidence Check" inquiries, started by the IUSS and brought to fruition in the form of inquiries into early literacy interventions and homeopathy. These inquiries asked (1) *What is the policy?* and (2) *On what evidence is it based?* and involved soliciting suggestions for scrutiny from members of the public, inviting government to answer the two questions in relation to a shortlist of policy areas, before choosing two for inquiries. The work of the Committee and its predecessors is recorded in the ninth report of the Session, *The Legacy Report,* published on 31 March 2010.

The Committee works closely with the House of Lords Select Committee on Science and Technology on an informal basis, and has the power to meet jointly with that committee, or one of its sub-committees, in formal session, to deliberate or to take evidence.

The Committee is served by a small secretariat from the Department of Chamber and Committee Services, and can appoint specialist advisers to assist it in dealing with matters of an especially complex or technical nature.

Information about House of Commons Committees, including all published reports and evidence, can be found on the internet, via www.parliament.uk/science

SCIENCE AND TECHNOLOGY IN THE HOUSE OF LORDS

A House of experts

Ever since the middle of the last century, Prime Ministers have sent a small but steady stream of top scientists, engineers and medics to the House of Lords. The Appointments Commission has clearly sought to continue this tradition. Since 2001 it has appointed many eminent experts including two Presidents of the Royal Society, the President of the Royal Academy of Engineering, the Director of the Royal Institution, the Chief Executive of BP Amoco and the co-founder of a major pharmaceuticals company.

Select Committee on Science and Technology

The House of Lords has played to its strength in these areas. In 1979, following the abolition of the House of Commons Science and Technology Committee (since re-instated), the House of Lords appointed a committee "to consider science and technology". This is a very broad remit, covering any of the many places where science – in its widest sense – meets public policy.

Most recently, the Committee has consisted of 14 members, with representation from all parties as well as the crossbench peers (independents). Membership has generally been balanced between top scientists and peers with an interest in science but with no specific scientific expertise. Of the Committee's last five Chairmen, three were scientists and three (not the same three) came from the crossbenches.

The Committee operates as follows:

- The Select Committee chooses a topic for inquiry.
- The Committee sets up a sub-committee to conduct the inquiry (or, on occasions, conducts the inquiry itself), with a Chairman, and extra members co-opted from the wider membership of the House to bring in additional expertise. The Committee has normally been resourced to support two sub-committees at any one time.
- The sub-committee proceeds in the usual manner of Parliamentary committees, issuing a Call for Evidence, holding oral evidence sessions and producing a report. Inquiries typically take between six months and a year.
- The Select Committee considers and agrees the report and publishes it.
- The inquiry Chairman introduces a debate in the House following the Government response to the report.

The range of the Committee's interests can be seen from a list of its recent reports:

Personal Internet Security	Waste Reduction
Systematics and Taxonomy	Pandemic influenza
Genomic Medicine	Nanotechnologies and Food
Setting Priorities for Publicly Funded Research	Radioactive Waste Management

The Select Committee reports formally to the House of Lords but its influence reaches beyond Parliament, with a long history of publications informing Government policy and raising awareness amongst the general public. Government responses are the first formal, explicit expression of the impact of the Committee's work upon Government thinking. However, while such responses are important, in reality the impact of the Committee's reports may be felt less directly and over much longer periods:

- The Committee's report on *Science and Society*, published in 2000, is still referred to as a landmark report on public understanding and engagement with science and continues to influence attempts to encourage engagement with science in many areas of public policy.
- The Committee's report in Science and Heritage in 2006 led to the development of a "national strategy" or vision for science and heritage amongst key stakeholders, the creation of a joint directed programme of £8 million run by the Arts and Humanities Research Council and

the Engineering and Physical Sciences Research Council, and the appointment of a Chief Scientific Adviser to the Department for Culture, Media and Sport.

- The Committee's 2007 report on allergy led, amongst other things, to an announcement by the Department of Health in August 2008 that the North West Strategic Health Authority would "lead on allergy services in a new drive to improve services for allergy sufferers", with £140,000 of funding.
- Following the Committee's report on *Personal Internet Security*, the Government announced funding for a Police Central e-Crime Unit and the creation of the National Fraud Reporting Centre.
- In response to the Committee's report on *Genomic Medicine* in 2009, Government committed to: establishing a cross-departmental Human Genomics Strategy Group to monitor advances in genetics and genomics research and evaluate their benefit to healthcare services in the NHS; and the development of a vision (including a strategic vision for genomic translational research) and a roadmap for genomic services in the NHS. In addition, the Government response noted that a review of the provision of genetic services within the NHS was being undertaken to ensure that the current inconsistencies in the service were corrected.

The Committee also contributes to the formation of policy through follow-up inquiries on many topics, often involving many of the original members who took part in the initial inquiry, providing long-term scrutiny of Government policies.

The Committee has a permanent staff of six, plus Specialist Advisers appointed for the duration of each inquiry. Co-operation with the Commons Science and Technology Committee staff, and with POST, is close.

Clerk: Chris Salmon Percival
Inquiries: 020 7219 6072
e-mail: hlscience@parliament.uk

Select Committee on the European Union
The largest body of committee work in the House of Lords is done by the European Union Committee and its seven sub-committees. Its remit is to scrutinise the law and policies of the EU. These regularly raise issues of science and technology, particularly within the remits of Sub-Committee B (for example energy, industry, transport, research and space) and Sub-Committee D (for example environment and agriculture).

Inquiries: 020 7219 6083

A free weekly notice of all House of Lords committee business is available: phone 020 7219 6678. Information, including full text of Calls for Evidence and reports, is on the Committee's web site www.parliament.uk/hlscience.

THE PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY

The Parliamentary origins of POST

The initiative to create the Parliamentary Office of Science and Technology came from within Parliament itself, as members of both Houses increasingly realised during the late 1970s and early 1980s the extent to which science and technology issues permeated Parliamentary business. The sense emerged of the need for an organisation which would provide Parliament with impartial information and analysis of science and technology issues. The UK was not alone in perceiving such a need - similar offices already existed in the USA, Denmark, France, Germany, the Netherlands as well as at the European Parliament.

A funding appeal by the Parliamentary and Scientific Committee enabled POST to be established as a charitable foundation in 1989. After three years' demonstration of the services that could be provided to Parliament in general, as well as to Select Committees, the case for its parliamentary establishment was reviewed by the House of Commons Information Committee during the 1991/2 session. The Committee recommended that Parliament should directly support the work of POST from 1993 to 1996. The House of Commons endorsed this in June 1992, followed by the House of Lords in October 1992. In April 1993, POST thus became, unusually, an office of both Houses of Parliament. In October 1995, the Commons Information Committee recommended funding for POST until at least 2001 and in July 2000 concluded that POST had demonstrated its value such that it ought to be made a permanent institution. The House of Lords concluded similarly in early 2001, so that on April 1 that year, POST indeed became a permanent institution serving both Houses.

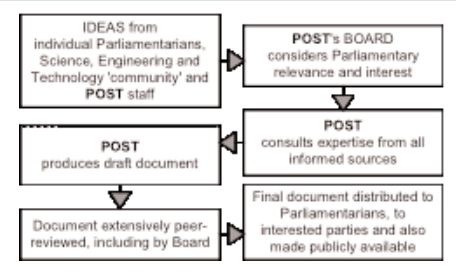
POST's operations
POST provides parliamentarians with information and analysis to enhance their understanding of current scientific and technological issues. It responds to such parliamentary needs, whether they reflect a general requirement, or the specific interests of committees. POST places a strong emphasis on anticipating forthcoming policy issues, whose effective handling will require understanding of their scientific and technological aspects. POST draws on the knowledge, expertise and talents of its parliamentary and external Board members and its staff but also connects systematically with the science and engineering community within the UK and globally. POST acts as a totally independent and objective source of information and analysis. It is politically neutral, serves Parliament as a whole and tailors its work to specific parliamentary needs.

POST's Board is appointed by official parliamentary procedures and has 14 members from both Houses (many of whom have been active scientists or engineers), from all the major parties. There are also four distinguished non-parliamentary members who provide professional input from the main science, engineering and medical disciplines. The Board determines POST's general policy and priorities, and ensures that it has an effective, practical working relationship with members of both Houses, parliamentary committees, the parliamentary libraries and a wide range of organisations outside Parliament. POST's Director and staff execute the policies determined by the Board and help it to decide on topics for future analysis. A new Board will be appointed for the new Parliament. POST produces two main types of publications. The most numerous and

distinctive are 2-4 page briefings, called POSTnotes that aim to summarise succinctly the factual background to, and main policy issues affecting, a particular subject. Examples produced over the last year include H1N1 'Swine Flu' Vaccine, Counterfeit Medicines, Insect Pollination, Global Carbon Trading, Technology of the Olympics and Space Debris. Longer reports, up to 100 pages, are also produced. The longest and most complex report ever produced by POST, at the direct request of the House of Commons Defence Select Committee, was on the sensitive subject of *Terrorist Attacks on Nuclear Facilities*. All POST publications, whatever their form, are extensively peer reviewed in draft, to ensure their accuracy and completeness.

The Production Process for POST PublicationsPOST and Parliamentary Committees

POST works very closely with committees in both Houses. While this certainly includes the two Science and Technology committees, it is by no means restricted to them. POST has assisted virtually all the Commons committees as well as the Lords European sub-committees and Economic Affairs committee and ad-hoc committees, including joint committees of both Houses. POST's assistance can be through oral briefings and various kinds of background research, through to extensive follow-up of a committee's report. In fact, work begun in collaboration with a committee often leads to a POST publication.



POST in the Wider World

POST is an active member of the European Parliamentary Technology Assessment network (EPTA) that brings together the 19 offices that now serve the European parliament and national and regional parliaments in numerous European countries. In the last year, the Science and Engineering sections of the US Congress' Government Accountability Office have applied for associate membership of EPTA. This collaboration enables it to keep abreast of issues with an international dimension and has resulted in participation in several joint projects.

Since 2007, POST has also had a special project, in collaboration with organisations such as the Royal Society, to promote activities similar to its own at Parliaments in Africa. Several fellows from African parliaments have spent three months with POST, supported by Commonwealth Professional scholarships – and numerous events have been held in several countries of eastern Africa.

For further details on POST please contact the director:
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THE ROYAL SOCIETY OF CHEMISTRY

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The Royal Society of Chemistry [RSC] is the leading scientific society in building bridges between the scientific community and Parliament. The Society is a learned, professional body and a registered charity, which operates under its Royal Charter commitment "*to serve the public interest*" and in this spirit undertakes a wide range of Parliamentary activity designed to offer assistance to MPs and Peers on all sides of both Houses at a time when more and more of the issues they face have a scientific aspect to them.

In doing so, the RSC promotes the chemical sciences, education, engagement with the wider public, and is a major publisher of scientific books and journals. It campaigns publicly, and through MPs and civil servants, for more funding on teaching and fundamental research in universities, the need for higher educational standards in schools, coupled with more, better qualified science teachers and well-equipped laboratory facilities. These commitments are necessary for the UK to remain commercially competitive. The RSC encourages the UK Government to support scientific, technical and medical publishing, because of its significant contribution to gross domestic product.

Parliamentary Link Scheme

At the heart of the Society's contribution to Parliament is its pioneering *Parliamentary Link Scheme* which is open to every Member. It is an All-Party scheme that "links" an MP with a professional member of the Society who lives in that MP's constituency. This *Society Link* is someone to whom the MP can turn if she or he needs information or advice on science, especially relating to the chemical sciences. Well over 200 MPs have benefited from this Link Scheme in recent Parliaments and the Society offers Link Scheme membership to every Member elected in the new Parliament. One of the Link Scheme's greatest attractions is that an MP doesn't have to do anything! This is a service provided by the RSC for the public good to assist MPs in their Parliamentary role.

Parliamentary Links Day

Once a year in June the Society holds a special event in the House known as *Parliamentary Links Day* which is now the largest annual scientific event held in Parliament – with contributions in recent years from the Prime Minister, the Chancellor, senior Cabinet Ministers, Government Chief Scientific Advisers, Chairs of Select Committees and leading Parliamentarians, as well as scientists of international renown. *Links Day* involves the core science and engineering community which provides MPs and Peers with short presentations on a wide variety of topics – whether the economy, health, education, energy, climate change and the environment, sustainability, sport, leisure, food security and many other subjects relating to science. All MPs and Peers are invited.

Parliamentary Events

The Society also organises special events in Parliament such as the *Science and the General Election 2010* debate which made Parliamentary history for being the first ever live webcast from the House. The celebrated annual series of *Voice of the Future* events has brought young

scientists and engineers to Parliament for a special *Science Question Time* with MPs on the Science & Technology Select Committee and the Minister of Science. The Society organised the first exhibition ever held in Westminster Hall and other events have included Parliamentary Receptions for British Nobel Prize Winners or outstanding British scientists, the annual *Bill Bryson Science Prize* for primary and secondary schools, and *Parliamentary Awards* for outstanding contributions by MPs and Peers to the cause of science.

Parliamentary Briefings
The Society provides MPs and Peers with Parliamentary briefings on science issues that arise in Parliament: whether for Questions, Ministerial Statements, Committee and Report Stages of Bills, or Adjournment Debates. The Society provides briefing for science debates, submissions to Government or Select Committees, and provides Background Briefing Papers on all chemistry-related subjects. Over recent years the Society's briefings have been referred to in *Hansard* on countless occasions.

Devolution, European and World Affairs
The RSC actively builds relationships with the devolved bodies in the UK and organises major science events involving the entire science & engineering community including the annual *Science and the Parliament* (in Edinburgh) and *Science and the Assembly* (in Cardiff) and an inaugural *Science and the Assembly* event (at Stormont). The RSC has also established Cross Party Groups on Science & Technology in both the Scottish Parliament and Welsh Assembly. The RSC can provide assistance to UK MEPs and has contributed to major EU events. The RSC is an international organisation with strong links within Europe and the USA, Africa, Asia and the Far East and elsewhere, and its worldwide membership gives the RSC a truly global reach.

THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE

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Administrative Secretary; Mrs Annabel Lloyd
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The Parliamentary and Scientific Committee is the longest-serving All Party Group in Parliament. It was established over 70 years ago to bring together scientists, engineers and Parliamentarians to consider key scientific issues relevant to policy, society and the economy at a critical point in the UK's history. It provides a primary focus for scientific, technological, engineering and mathematically based (STEM) issues that helps to generate a long-term liaison between Parliamentarians on the one hand and scientific, technological and engineering organisations, scientific and engineering-based industry and universities on the other. The main aim is to provide Members of both Houses of Parliament with authoritative information on STEM-based topics and help with the consideration of their inter-relationship with other matters of public interest and the development of policy.

Meetings
The Committee runs a lively programme of monthly meetings and breakfast briefings. The Committee meets once a month when Parliament is sitting, to debate a STEM-based topic and its relationship with political issues selected to address the particular needs of Members of Parliament. Held in the Palace of Westminster, these meetings allow Parliamentarians to listen to some of the UK's most eminent scientists and engineers. Peers and MPs can engage with them on the science and technologies relevant to such policy issues as energy, health, food security, climate, transport, innovation and business. They take place in a Committee Room, starting at 5.30pm and are usually followed by informal receptions which provide excellent opportunities for networking. Most debates are followed by a working dinner where the informal atmosphere facilitates open and wide-ranging discussion.

Annual Luncheon
The Committee's Annual Lunch, currently held in the Cholmondeley Room in the Palace of Westminster, is a significant event in the Parliamentary calendar, when some 120 Parliamentarians and leaders of the scientific and Engineering establishment and industry assemble to hear an address. Speakers have included every Prime Minister since the war, Leaders of the Opposition, Presidents of the CBI and the Royal Society, the Duke of Edinburgh, the Prince of Wales and the Princess Royal.

Membership
Before the election the Committee had 126 Parliamentary members: 67 from the House of Lords; 59 from the House of Commons; the Scientific membership was made up of representatives of 228 bodies including scientific and technical institutions, science-based companies, universities, organisations and individuals representing those significantly affected by science and engineering.

All Party Engineering Group (APEG)
APEG has recently joined the Committee, strengthening both science and engineering in the Houses of Parliament following very careful negotiation between the two bodies and with the support of the Royal Academy of Engineering. APEG's members are already attending Committee meetings. The fusion of the two organisations should strengthen the impact of discussions on STEM subjects generally in both Houses of Parliament and amongst a significantly enlarged joint membership.

Science in Parliament
Science in Parliament, the journal of the Parliamentary and Scientific Committee, presents a comprehensive record of science, technology, engineering and mathematics within both Houses of Parliament and the European Community. It is published four times a year in February, May, July and October.

Website
The Committee's website, established in 2005, provides a well documented resource, currently recording the work of the Committee over the last five years, in which all of the articles published in Science in Parliament that are more than one year old are now made freely available and downloadable without charge, in the interests of public information concerning the discussion and debate in Parliament of STEM-based topics.

PARLIAMENTARY GROUP FOR ENERGY STUDIES (PGES)

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About Us
MPs and Peers founded the Group in 1980 to establish a permanent

high-level dialogue in anticipation of future energy problems. These arise from decisions involving such long lead times that it falls to a future Government to handle the consequences. The Group's 30th anniversary was celebrated with a reception in March at 11 Downing Street, with kind permission of the Chancellor of the Exchequer.

Membership
Prior to the general election, the Group enjoyed the membership of some 180 MPs, Peers and MEPs – drawn from all political parties – and 110 associate members from companies, institutes, user groups, representative bodies, regulatory bodies and embassies.

Meetings and Presentations
Roughly once a month members hear a speaker at the Palace of Westminster. Recent speakers have included:
Rt Hon Malcolm Wicks MP – Special Representative on International Energy & former Energy Minister
Rt Hon Lord Hunt of Kings Heath OBE – Energy Minister
Prof Ian Bryden – Chair of renewable Energy, University of Edinburgh
David Clark – Chairman of the Russia Foundation.

The off-the-record discussion, which follows the speaker's address, is a valued feature.

Visits
The Group has been fortunate enough to travel far and wide on a range of energy visits. It hopes to arrange a four day visit to Azerbaijan in September

Receptions and Dinners
The annual dinner takes place in the Cholmondeley Room of the House of Lords with a Minister or industry CEO as guest of honour. A summer reception for members and Ministers is held on the House of Commons Terrace.

Energy Focus
Energy Focus is the Group's journal. Published three times a year, it contains the papers of our speakers and catalogues relevant Parliamentary proceedings.

In the New Parliament…
Tuesday 13th July
evening reception on the House of Commons Terrace
kindly sponsored by the UK Business Council for Sustainable Energy.

PARLIAMENTARY INFORMATION TECHNOLOGY COMMITTEE (PITCOM)

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Set up in 1981, PITCOM is a policy forum on information and communications technology and its implications for society. Until Parliament was dissolved in April Andrew Miller was its Chairman.

Membership
In the last Parliament PITCOM enjoyed the membership of 296 MPs, Peers, corporate representatives and academics from the ICT world.

Meetings and Presentations
Monthly meetings are held with speakers in the House of Commons, sparking lively debate. Recent speakers have included:
Christopher Graham – Information Commissioner
Rt Hon Stephen Timms – Financial Secretary to the Treasury
Shami Chakrabati CBE – Director of Liberty
Film director Lord (David) Puttnam CBE.

Receptions and Dinners
A dinner is held in the House of Lords in November/December each year, and a reception on the House of Lords Terrace in June.

Briefings
- Accounts of meetings with speakers are professionally authored and posted on PITCOM's website
- PITComms are also produced for Members of Parliament. These specialist briefs on topical subjects are available in the Derby Gate Library.

Make IT Happy
PITCOM's UK wide primary schools competition aims to involve 9 – 11 year olds in their community and to foster the use of ICT in an enjoyable way. MPs play an active role in urging their head teachers to take part. Prize cheques will be presented by Mr. Speaker at an awards ceremony in October, to which the Members for all regional winning schools will be invited.

In the New Parliament…
Tuesday 22nd June 6.00 pm
Martha Lane Fox
Champion for Digital Inclusion
+ Summer reception: House of Lords Terrace
kindly sponsored by Motorola.

PARLIAMENTARY SPACE COMMITTEE

The Parliamentary Space Committee is one of the most respected and active All-Party Groups, with over 100 members from both Houses and around ten events each year. The PSC exists as a cross-party group with the aim of raising awareness in Parliament of the growing importance of space and satellite-enabled services to our lives, our economy and our policy making.

Think space, think people – satellites underpin our modern way of life, enabling information and communication on the move, securing our borders and critical national infrastructure, monitoring the rainforests, and helping to rebalance our economy. We all use satellites every day, from the alignment of train doors with station platforms, to buying National Lottery tickets. Britain is a pioneer and a world leader in small satellites, communications satellites, space science and satellite TV and broadband. The sector supports 70,000 jobs and adds £6.5 billion to the economy, and enjoys strong cross-party support.

The PSC has traditionally focused on the 'down to Earth' benefits from space. We have held events on a broad range of subjects, including the use of satellites in the Olympics (satellites were commissioned for both the Athens and Beijing Olympics, both built in the UK); Africa (satellites offer sustainable infrastructure for many developing countries); broadband and many more. The PSC also works closely with other organisations in and around Parliament, including the Parliamentary Office of Science and Technology, the Climate Change All-Party group, the Parliamentary and Scientific Committee. The PSC holds at least four flagship events each year, annual summer and Christmas receptions, and a number of themed dinners. We also regularly visit the Farnborough and Paris Air Shows, and provide the UK parliamentary delegation to the annual European Inter-parliamentary Space Conference.

For more information, visit www.parliamentaryspacecommittee.com, or contact Tom Gunner, PSC Secretary, on 020 7304 6937 / 07887 826154, or visit the PSC office in the IMechE headquarters at 1 Birdcage Walk, just off Parliament Square.

SCIENCE DIARY

THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE

Contact: Annabel Lloyd
020 7222 7085:
lloyda@pandsctte.demon.co.uk
www.scienceinparliament.org.uk

Tuesday 15 June 18.00
Boothroyd Room, Portcullis House
Election of Officers and AGM
Followed at 18.30 by Discussion Meeting and Debate

Volcanic Eruptions, Catastrophic Earthquakes and Tsunamis – How Can We Reduce the Tolls on Humanity?

Professor Steve Sparks FRS, University of Bristol
Dr Rui Pinho, Secretary-General of the Global Earthquake Model
Dr Tiziana Rossetto, Director of Earthquake and People Interaction Centre (EPICENTRE) Department of Civil, Environmental and Geomatic Engineering, University College London

Tuesday 13th July 17.30
Discussion meeting
Topic and speakers to be confirmed

THE ROYAL INSTITUTION

The Royal Institution has now re-opened following its £22 million refurbishment, including the new Time & Space restaurant, bar and café. All events take place at the Royal Institution unless otherwise stated. See www.rigb.org or telephone 020 7409 2992 for full details and to book tickets. For additional details of these and other events visit www.rigb.org

THE ROYAL SOCIETY

Throughout 2010 the Royal Society is celebrating its 350th anniversary in a year-long celebration of the impact that science has had, and continues to have, on our lives.

The Royal Society hosts a series of free events, both evening lectures and two-day discussion meetings, covering the whole breadth of science, engineering and technology. In addition for its 350th celebrations the Society is teaming up with major cultural institutions in London as part of its Capital Science programme. Events, exhibitions and conferences are also being held in over 70 museums and galleries around the UK as part of the Royal Society's Local Heroes programme. For further details, please visit http://royalsociety.org/events/

THE ROYAL ACADEMY OF ENGINEERING

3 Carlton House Terrace, London SW1Y 5DG
www.raeng.org.uk/events or
events@raeng.org.uk
020 7766 0600

THE ROYAL SOCIETY OF CHEMISTRY

Tuesday 22nd June 10.00am

Parliamentary Links Day

The Attlee Suite
Portcullis House
The House of Commons

Refreshments from 9.30am
Lunch from 1pm

For details please contact Dr Stephen Benn benns@rsc.org or phone 0207 440 3381

ROYAL SOCIETY OF EDINBURGH

22-26 George Street, Edinburgh EH2 2PQ.
Tel: 0131 240 5000 Fax: 0131 240 5024
events@royalsoced.org.uk
www.royalsoced.org.uk
All of these events are free to attend but registration is required.

Monday 7 June 18.00

The Art of (Women) Walking: An Embodied Practice

Ordinary Meeting and BP Prize Lecture
Dr Deirdre Heddon, Reader, Department of Theatre, Film and Television Studies, University of Glasgow

Tuesday 15 June 18.00

An epidemiological perspective on the causes and prevention of breast cancer

Professor Valerie Beral, Head of Cancer Epidemiology Unit, University of Oxford
In association with the Scottish Cancer Foundation, supported by the Cruden Foundation

Wednesday 14 July 18.00

Climate Change during the last 10,000 Years: Reconstructions and uncertainties

Professor Heinz Wanner, University of Bern
Professor John Haslett, Trinity College, Dublin
Professor Gabriele Hegerl, Chair of Climate System Science, School of GeoSciences, University of Edinburgh
This event is organised by ICMS in association with the RSE and further supported by NCAS, SAGES and the Centre for Earth System Dynamics, University of Edinburgh

BRITISH SCIENCE ASSOCIATION

Please visit
www.britishscienceassociation.org for events programme.

ROYAL PHARMACEUTICAL SOCIETY OF GREAT BRITAIN

Contact: events@rpsgb.org
www.rpsgb.org/events

THE LINNEAN SOCIETY OF LONDON

Burlington House
Piccadilly
London W1J 0BF
Tel: +44 (0)20 7434 4479 ext 11
www.linnean.org
Unless otherwise stated events are held at the Linnean Society of London

Thursday 10th June 16.30

Sequencing the Red and the Dead

David Rollinson, Tim Littlewood & Richard Sabin

Thursday 17th June 18.00

The need for evidence based conservation

William Sutherland

SCIENCE IN PARLIAMENT sip 3 Birdcage Walk, London SW1H 9JJ
Tel: 020 7222 7085
Fax: 020 7222 7189
Editor: Professor Peter Simpson
Editorial Assistant: Mrs Annabel Lloyd

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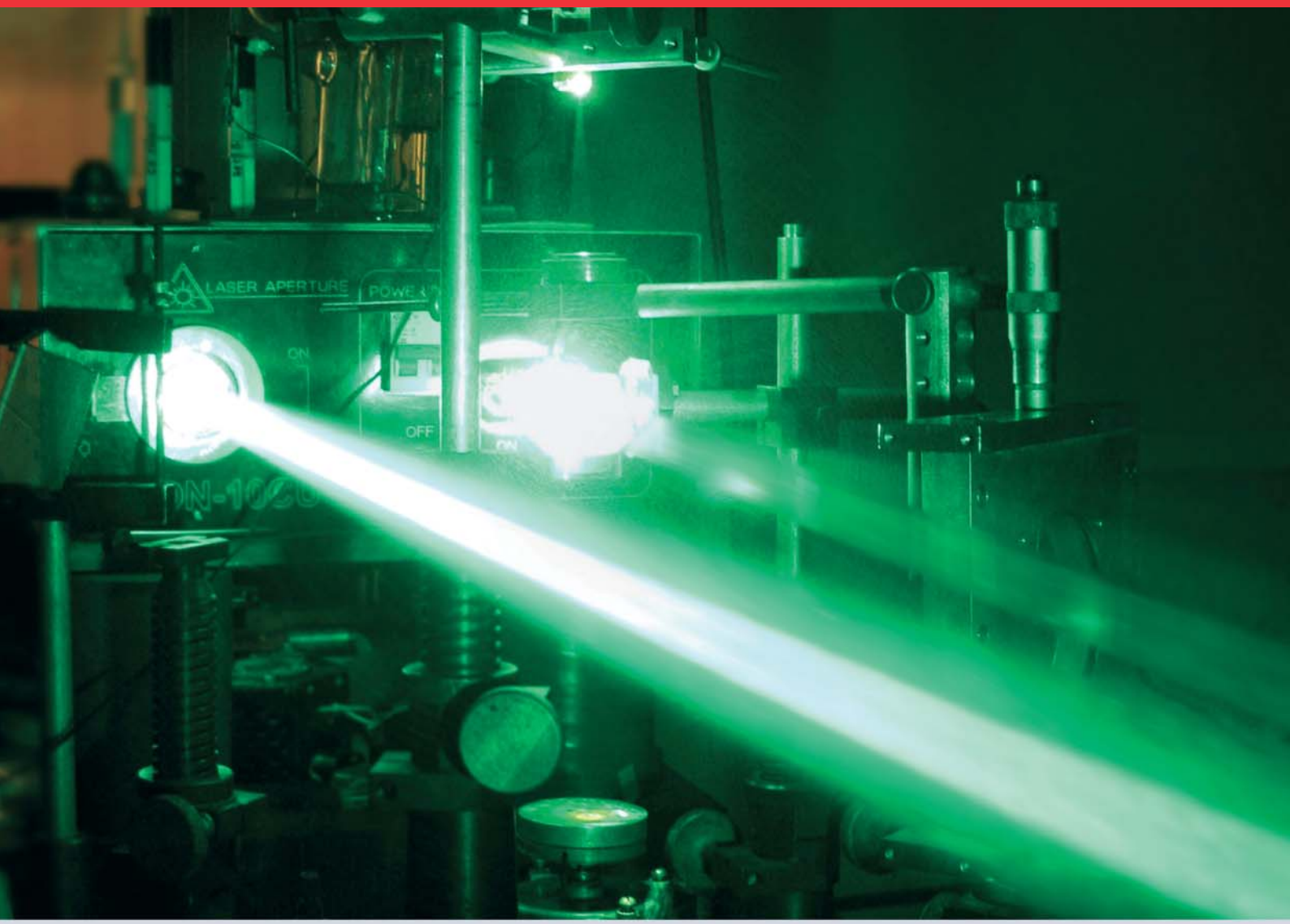

Physics an investment for the future

The Institute of Physics manifesto for the UK General Election of 2010

Our goals are:	
1 Access to high quality physics teaching for every child	✗
2 Funding for science that will keep the UK at the forefront of research	✗
3 A fiscal and regulatory environment that fosters science-based innovation	✗

IOP Institute of Physics