

70th Anniversary Lunch

The Nutt Case

Come Back GM

Environmental Risks

SCIENCE IN PARLIAMENT

sip

Spring 2010



The Journal of the
Parliamentary and
Scientific Committee

New UK technology for
sustainable agriculture

www.scienceinparliament.org.uk

SCIENCE IN PARLIAMENT sip

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 MP
Chairman,
Editorial Board
Science in Parliament

There are 75 Advisory Bodies to Government in the STEM policy area. So, it was a very rare event when Secretary of State Alan Johnson asked Professor David Nutt to resign as Chairman of the Advisory Council on the Misuse of Drugs (ACMD), an event that has caused a lot of debate. The Government has set out its principles for engagement between Government and those that provide independent advice. However, it is reserving the right to take advice into consideration but to ignore it if political considerations override that advice. Not all will agree.

The Department of Business, Innovation and Skills published its more detailed proposals for the allocation of funding under the new Research Excellence Framework (REF, which replaces the RAE) last September, and has proposed weightings of 60% for outputs, 25% for impact and 15% for environment. The academic community has reacted strongly against these proposals, with 17,570 signatures being collected for an online petition in just seven weeks. The first REF exercise is due to be completed in 2013.

The controversy about REF comes at a time when the Government is seeking reductions in the science budget and countries such as the USA and Germany are increasing theirs. Efficiency savings of £180 million in the 2009 budget for Higher Education Institutions have been called for, with a further cut in their budget of 6.6% for the 2010-11 financial year – representing a reduction of £88 million for teaching and research. £600 million of reductions in the HEI budget were announced in the Pre-Budget report by 2013. The Government is still maintaining that STEM budgets will be protected. However, HEIs are independent organisations, and cuts in STEM subjects can result in the largest savings for Vice-Chancellors, as we have seen in the past. The HoC Science & Technology Select Committee has launched an inquiry as a result of these announcements.

As if there are not enough controversies around, the work of the Climatic Research Unit at the University of East Anglia came under fire as a result of leaked e-mails immediately prior to the UN Climate Change Conference in Copenhagen.

Congratulations go to the Government on its creation of the UK Space Agency.

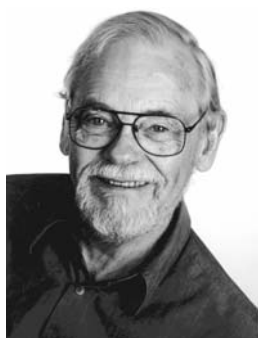
The Russian discovery of element 114, ununquadium (Uuq), has been confirmed by a team at the University of California at Berkeley.

CONTENTS

THE NUTT CASE AND ITS SEQUELAE Lord Rea	1	SCIENCE AT THE BRITISH COUNCIL Martin Davidson	16	IAN TAYLOR'S VISIT TO THE LARGE HADRON COLLIDER AT CERN	37
THE ROLE OF THE CHIEF SCIENTIFIC ADVISER, MINISTRY OF DEFENCE Professor Mark Welland FRS FREng	2	NECESSITY SHOULD BE THE MOTHER OF INNOVATION Professor Martin Binks, Dr Simon Mosey and Paul Kirkham	18	HOUSE OF COMMONS SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY	39
THAT WAS 13 YEARS THAT WAS!! Dr Ian Gibson	4	ENVIRONMENTAL RISKS – HOW BEST TO ADAPT TO THE IMPACT OF GLOBAL WARMING? Addresses to the P&SC by Lord Broers FREng FRS and Professor Paul Ekins	20	HOUSE OF LORDS SCIENCE AND TECHNOLOGY SELECT COMMITTEE	41
GERMANY STRENGTHENS SCIENCE AND INNOVATION TO SECURE FUTURE WEALTH Ursula Roos	5	COME BACK GM – ALL IS FORGIVEN? Addresses to the P&SC by Professor Peter Shewry and Professor Howard Atkinson	25	HOUSE OF COMMONS LIBRARY SCIENCE AND ENVIRONMENT SECTION	42
THE UK RESEARCH BASE Professor Adrian Smith FRS	6	SEVENTIETH ANNIVERSARY LUNCHEON OF THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE Guest of Honour Professor John Beddington CMG FRS	29	PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY	43
THE CHALLENGES FACED BY MICROBIOLOGISTS Professor Geoff Hanlon	8	THE DEEP	32	WITH SUCH MINERAL WEALTH WHY IS TANZANIA NOT RICHER?	45
SCIENCE AND ENGINEERING AT THE HEART OF HEALTH AND SAFETY Judith Hackitt CBE	10	EMERGING TECHNOLOGIES – EMERGING MARKETS Dr Philippa Bell	34	LETTERS TO THE EDITOR	46
FOOD SECURITY, INNOVATION AND INDUSTRY	12	THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE VISIT TO THE DARWIN CENTRE, NATURAL HISTORY MUSEUM	35	PARLIAMENTARY AND SCIENTIFIC COMMITTEE NEWS	47
REPRESENTING OUR SCIENTISTS Andy Boseley	14			2009 RSC BILL BRYSON SCIENCE PRIZES	48
WHAT'S THE POINT OF A TRADES UNION? Marijke Smith	15			SELECTED DEBATES AND PARLIAMENTARY QUESTIONS AND ANSWERS	48
				EURO-NEWS	54
				SCIENCE DIRECTORY	55
				SCIENCE DIARY	64



THE NUTT CASE AND ITS SEQUELAE: HAVE MINISTERS GOT THE MESSAGE?



Lord Nicolas Rea

During a welcome period of increasing co-operation between science and Government, the summary dismissal of Professor Nutt as Chairman of the Advisory Committee on the Misuse of Drugs by Alan Johnson, the Home Secretary, caused consternation in the scientific community and the resignation of five other members of the ACMD. The reason given by the Home Secretary for his action was that he had "lost confidence in Professor Nutt as my principal drugs adviser"*. This was ostensibly because of a peer-reviewed article and a lecture by Prof Nutt which were critical of the current Home Office system of classification of the harmfulness of drugs. These presentations had been made by Professor Nutt in his capacity as an academic neuropsychopharmacologist, not as chairman of the ACMD. Media reporting, however, may not have made this clear.

Professor Paul Wiles, Chief Scientific Officer at the Home Office, had alerted Professor Nutt that his forthcoming peer-reviewed paper in the *Journal of Psychopharmacology* in January 2009: *Equasy: an overlooked addiction with implications for the current debate on drug harms* (showing that horse

riding caused a comparable number of deaths to ecstasy/MDMA as well as severe spinal injuries) "might be perceived as insensitive". He was duly castigated for allowing this paper to be published by the then Home Secretary, Jacqui Smith, whose office [according to Alan Johnson], had received "multiple complaints" from the parents of children who had been harmed by ecstasy*. (But none apparently from the parents of those who had been harmed by falling off horses).

In his Eve Saville Lecture at King's College in July 2009: *Estimating Drug Harms: a Risky Business*, Professor Nutt lucidly described the problems involved in classifying the harmfulness of different drugs objectively, pointing out, as in the *Equasy* paper, that some legal substances and activities, in this case drinking alcohol or smoking tobacco, are in fact more harmful than many illegal drugs (a fact well known to those working in the addiction field). He suggested that any rational classification of relative harmfulness should recognise this and that this classification should be based on objective criteria of harm under three headings: physical harm, dependency, and social harm, and that this assessment should

be carried out by an expert group, qualified to obtain and assess the evidence, free from political influences. However he explicitly recognised the need for a political input in formulating drugs policy as a whole. The paper was carefully written in a non polemical style and convincing evidence was given to support every point made.

Relations between the ACMD and the Government have been less than cordial since the rejection of the ACMD's recommendations that Ecstasy/MDMA be downgraded from class A to B and that Cannabis remain a class C drug. These Government decisions were made for political rather than scientific reasons and were taken despite the requirement in the Misuse of Drugs Act, 1971, that the MDMA (which was set up by the Act) be consulted on any proposed changes to drug classification.

On November 6th, a week after Professor Nutt's dismissal, a group of scientists, including some of the most eminent, produced: a *Statement of Principles for the Treatment of Independent Scientific Advice*, with the assistance of "Sense about Science". This was presented by Lord Rees, President of the Royal Society, to the Prime Minister and copies sent to Lord Drayson, Minister for Science, and Professor John Beddington, the Chief Scientist. These Principles are given in full in the Report of the House of Commons Science and Technology Select Committee of

... Professor Nutt has announced the formation of a new Independent Scientific Committee on Drugs, which will be completely independent of Government

Dec 9th 2009.* They emphasise the need for scientists who advise the Government to be free to publish and promote their work: "In the context of independent scientific advice, disagreement with Government policy and the public articulation and discussion of relevant evidence and issues by members of advisory committees cannot be grounds for criticism or dismissal". The spirit of the Principles was accepted by Lord Drayson, who said on 23rd November: "... it is (so) important for the Government to reiterate the importance of the independence of scientific advice, and to have clarity

between the scientific community and the Government on the rules of engagement between the two." Following this a document: *Principles on scientific advice to Government* was published on 15th December by the Government Office for Science which has invited views on it as part of the consultation on *The Guidelines for the Use of Scientific Analysis* (published earlier) which runs until 9th February. These principles meet many of the points covered by Lord Rees' document. However it contains one paragraph which is not compatible with these: "The Government and its scientific advisers should work

together to reach a shared position, and neither should act to undermine mutual trust". It is difficult to reconcile this with true independence for scientific advisers whose findings may well point in a different direction to current Government policy. For example, the policy of the "shared position" had a serious effect in delaying effective action in the BSE epidemic. It is to be hoped that when the new guidelines are published this paragraph will have been altered so that the independence of scientific advisers is properly protected in the future.

At the time of going to press Professor Nutt has announced the formation of a new

Independent Scientific Committee on Drugs, which will be completely independent of Government. The Committee will include those who have resigned from the ACMD as well as other scientists expert in the drugs field. Its findings and reports – and the Government's response – are awaited with great interest.

*Ref: House of Commons Science and Technology Committee: *The Government's Review of the principles applying to the treatment of independent scientific advice to government*. Third Report of Session 2009-10, Vols I and II

THE ROLE OF THE CHIEF SCIENTIFIC ADVISER, MINISTRY OF DEFENCE



Professor Mark Welland FRS FREng
MOD Chief Scientific Adviser
Professor of Nanotechnology,
University of Cambridge

Since the Second World War, scientific advisers have played a critical and integral role in Britain's defence. The strength of the relationship between military commanders and defence researchers was recognised in the creation of the post of Chief Scientific Adviser (CSA), which has existed for as long as the Ministry of Defence itself. The formal responsibilities of the role have hardly changed since then.

As well as the core remit of providing scientific advice to the most senior members of the Department and the Armed Forces, the CSA chairs both the Research and Development Board and the Investment Approvals Board. The breadth of the role offers the opportunity to inspect, investigate and interrogate almost any programme to almost any level, placing the CSA at the very heart of MOD's Science and

Technology programme.

At the same time, however, the detail of the role has changed dramatically, and continues to change, and the other privilege that the job carries is having both the ability and the duty to shape its exact nature to the specific challenges of today – and tomorrow. At a time of rapidly changing threats to Britain and to our Armed Forces abroad, as well as of the ever-increasing pace of scientific

development, it is crucial that MOD remains at the very forefront of defence technology.

There are new challenges for us to respond to. In the coming years it will be vitally important for Britain's Armed Forces to reduce their dependence on fossil fuels, for operational reasons as well as to combat climate change, so research into alternative sources of power are high on our agenda. The threat from Improvised Explosive

Devices in Afghanistan has prompted a large and on-going programme to rapidly develop better ways of detecting and neutralising such devices, to protect soldiers from them when that is not possible, and to improve medical care for those harmed by them. At home, the threat from terrorism requires an ever more sophisticated scientific response, particularly where the possibility of biological and chemical attacks is concerned.

The other challenge facing defence research at the moment is financial. The current situation is liable to affect everything from funding for individual projects to discussions of the goals and purpose of MOD research itself, and it is vital to plan accordingly. This does not necessarily mean reducing the scope of our efforts, but instead we must ensure that we use the resources that we have as effectively as possible. Such a goal will require flexibility, efficiency and, perhaps most importantly, creativity. We must expand and diversify the sources for our ideas so that we have the broadest possible range – the wider we cast our net, the greater the variety of ideas we will gather. Defence must adapt the technology made available through the considerable investment made by Government through the science budget and by the commercial sector. The same measures will better equip us to

face the growing unpredictability of future threats.

As well as new challenges for us to face, there are new technologies for us to utilise. Among many others my own area of expertise, nano-technology, has the potential to be of great use to defence in coming years. Military uniforms that can adapt their camouflage to their surroundings and their level of insulation to the weather, monitor soldier's health and transmit diagnoses to doctors, and detect bio-chemical weapons, could all be possible. The breadth of the role that emerging technologies can play is limited only by the uses we can imagine for them. Encouraging new ideas and developing them from the drawing board to the battlefield as quickly and efficiently as possible is more important than ever.

This means that we have to change the way we do business. In particular, MOD is currently working to make our technological requirements as clear as possible, and to involve as many sources as we can, from established suppliers through new small enterprises and academia to individuals with bright ideas. For the first time, we have publicly announced our detailed research needs to the entire UK science and technology community, in the Defence Technology Plan (DTP). The DTP provides clear direction to the R&D community on

... Military uniforms that can adapt their camouflage to their surroundings and their level of insulation to the weather, monitor soldier's health and transmit diagnoses to doctors, and detect bio-chemical weapons, could all be possible ...

investment in defence technology and seeks fresh, innovative thinking. Its Capability Visions identify ground-breaking options to address long-term defence challenges by stimulating new work and new applications for existing technologies.

We have also established a new first point of contact for anyone with an innovative defence-related idea, the Centre for Defence Enterprise (CDE). Since its inception the CDE has received over 1000 submissions and funded over 200 of them. Importantly, almost two-thirds of these funded proposals have been placed with small or medium-sized enterprises, many of which are new to defence. The CDE brings increased speed and agility to the defence research supply chain. By encouraging anyone with a good idea to step forward, they provide a unique and innovative entry point into the defence market.

This commitment to a new level of openness in the way that MOD does business with the scientific community reflects my own concerns. My

independence as a scientist is vitally important to me, and I believe it allows me to do my job better. When proposals are independently scrutinised and decisions on them made based on independently-assessed evidence, those decisions are far more likely to be the right ones. Reducing bureaucracy, including being careful to classify material only where it is absolutely necessary, speeds up that process. And widening the interaction between MOD, Britain's scientific community, and society more broadly will, I believe, reap considerable dividends.

At the moment we are succeeding. But new trials will always emerge, and staying one step ahead of the game is going to become ever more difficult, so MOD must constantly seek new ways of maintaining its technological advantage. It is an exciting and a testing time, but I believe that MOD and the scientists it depends upon will rise to the challenge.

... The breadth of the role that emerging technologies can play is limited only by the uses we can imagine for them. ...

THAT WAS 13 YEARS THAT WAS!!



Dr Ian Gibson

I remember the conversation well. Ed Balls, whilst still in the Treasury in 1997, was confident that science after the barren years from 1979 was to receive support. And it did! New labs in schools and universities, better postgraduate stipends, revisions of the science curriculum and a doubling of the science budget have been delivered. And yet I believe we have not won the argument that science, technology and engineering underpin our economy and its success.

I have always believed that the way out of the recession was to use our strengths in the UK, our scientific base and

expand it even more to produce innovation in the health industries, biotechnology, green technologies agriculture and nanotechnology.

It seems this is not to happen. Budgets will be slashed and jobs lost. The production of science, technological and engineering graduates looks certain to suffer as morale sinks in higher education.

It's easy of course to talk about the good old days of science but much more difficult to extol its virtues in the current situation.

I was very pleased to see from 1997 onwards Ministers of Science appointed and indeed recently enter the Cabinet. The appointment of Ministers from the Lords however with the implications of 'buying the job' by donating funds to the Government Party, was always bound to be picked up by a hostile press. Support for science, however, survived as it rose up the political agenda.

It looks like science will suffer in the new 'age of public sector cuts'. I look back with a fondness for the heady days of science when the Commons Select Committee on Science (1997-2005) took up so many issues. We inquired into the role of The Royal Society, forensic science, science in the developing world, nanotechnology, the Research Councils, light pollution, the new technologies in human embryology, the research assessment exercise etc. All of which resulted in Government action. The Committee decision

to move science into the media received the support of scientists in the field and helped Science raise its profile in Parliament. Whips hated our view and The Royal Society picked up on certain issues and felt they should address them too. Press Officers were appointed to the Committee, Chairs were paid, but still Whips were allowed to appoint members of the Committee and Chairs.

The growth of science was mirrored by the development of the anti-science movement particularly in the GM debate. There is still no acknowledgement by many scientists that they were slow to pick up on the hostility to new technology. We are witnessing it again in the Climate Change debate and in particular over those e-mails. I am sure we will go through the agonies again with GM, nanotechnology and agriculture in the food security debate. There is a desperate need for a scientific presence in Parliament in the coming years. I note that the few qualified scientists will no longer be present in the next Parliament. The activities of debate, questioning and inquiry will be seriously diluted in an almost science-free Parliament. Will we still hear Ministers talking about being able to see the Milky Way on the internet, migrating birds blamed for passing diseases to animals and then on to humans? And will we have a scientifically illiterate elected House?

There is need for a think-tank which reaches out into the scientific arena and activates the

rank and file research scientists, postdoctoral and postgraduate students. I believe Newton's Apple will fulfil this role and help scientists engage with the political process. Societies are not engaged with the black arts of politics. A Council of Science, Technology and Engineering or a Ministry answerable to elected members should be the powerhouse for debate and decision making.

A model, which I enjoyed, could be the Parliamentary and Scientific Committee. Those dinner sessions after the monthly talk were stimulating, informed and led, for example, to calls for an inquiry into Food Security and the role of the UK Government. This was delivered. I miss them. They were a delight to attend, unlike those scientific debates in the House where a stand-in from Government merely read from a script with no passion or knowledge of the subject.

I hope there will continue to be voices speaking up for science. I cannot see young scientists entering the House as MPs given the current situation, and failure to engage with politics. The work will have to be channelled through extra-parliamentary activity if we are to see science influence on policy.

Dr Ian Gibson is former Chair of the Commons Select Committee of Science and Technology 2001-2005; Chair of the Parliamentary and Scientific Committee; Chair of the Parliamentary Office of Science and Technology; Dean of the School of Biological Science at the University of East Anglia.

GERMANY STRENGTHENS SCIENCE AND INNOVATION TO SECURE FUTURE WEALTH

GERMANY'S INNOVATION LANDSCAPE

Germany's gross domestic expenditure for R&D was €61.48bn in 2007, 2.54% of GDP. Over two thirds of this was funded by industry. Federal research and education funding is allocated through three main channels - base funding for Germany's research organisations such as Fraunhofer, bottom-up support for innovative SMEs, and thematic research programmes. The latter are funded under Germany's *High Tech Strategy*, launched in 2006, whose overarching objective is the creation of lead markets in commercially relevant areas. The priorities reflect German strengths in areas including nanotechnology, optical engineering, cleantech and manufacturing. Industry is actively involved in developing the research agendas under the strategy and leverages public-sector funding well above matching levels.

SCIENCE & INNOVATION POLICY PRIORITIES UNDER THE NEW COALITION

In the middle of one of its gravest economic crises, Germans were called to the ballot box in September 2009. The result was change but with some continuity. While Germany continues to be governed by a coalition led by the Christian Democratic and Social Unions, their previous coalition partner, the Social Democrats, have been replaced by the Liberal Party.

In the area of science and innovation, the new coalition will build on the achievements of the old: just before the election it agreed with the Federal Länder to jointly fund 275,000 additional places at universities, invest a further €2.7bn to boost university research excellence and increase base funding for Germany's non-university research organisations by 5% annually.

The new Federal Government is determined to implement these initiatives and build on the successful *High-Tech Strategy*. There is

consensus that education, science and innovation are essential for Germany to remain competitive and to be able to meet future challenges such as climate change, energy security, demographic change, security threats and greater mobility. The individual measures outlined in the coalition agreement include

- **Increasing federal expenditure on education and research to €12bn by 2013:** The aim is to bring Germany's expenditure for education and R&D to 10% of GDP by 2015. The 2010 projected federal budget includes a €750m increase for education and research on 2009.
- **Improving the framework for innovative companies and high-tech start-ups:** Measures under consideration include the introduction of R&D tax incentives, the establishment of a public-private fund to promote start-ups, and government guarantees for investments in high-tech, high-risk companies.
- **Promoting innovative industries:** Germany's High-Tech Strategy will remain the

main mechanism for boosting innovation. However, SME participation, knowledge transfer and validation of research results will play a greater role.

- **Creating lead markets for new technologies:** A transport and mobility research strategy is planned with a focus on electric cars and battery technologies. Another priority will be energy efficiency, energy storage, smart grid technology, and 2nd generation biofuels.
- **Intensifying European and international collaboration in education and research:** Emerging and developing countries will be a priority. Germany will seek to play an active role in preparing the 8th EU Framework Programme, building on Germany's High-Tech Strategy as a model for Europe.
- **Promoting the responsible use of modern biotechnology:** The Federal Government plans to launch a strategy to promote the knowledge-based bioeconomy. Relevant work has been under way since January 2009.

INTERNATIONAL PERSPECTIVE

Germany's diverse research infrastructure and strong industry base make it an important international partner. The size of its R&D budget makes it a key driver of R&D in Europe. Germany draws on long-standing bilateral research partnerships – often going back decades. It is committed to entering new partnerships with both industrialised and emerging economies. Germany and China celebrated a joint Year of Science in 2009; this year the partner country is Brazil.

The UK Science & Innovation Team in Germany seeks to ensure that the UK remains aware of the opportunities Germany offers – in terms of best practice, complementary strengths and as European partner. In January, Business Secretary Lord Mandelson announced a review of the UK's innovation landscape. This will consider the model of Germany's Fraunhofer network which actively connects industry and research to improve business competitiveness. Technology entrepreneur Hermann Hauser will undertake a full evaluation of the UK's innovation network to see how the UK can emulate the benefits of the Fraunhofer model.

Contact:

Ursula Roos, Science & Innovation Section, British Embassy Berlin,
ursula.roos@fco.gov.uk

THE UK RESEARCH BASE



Professor Adrian Smith FRS
Director General, Science and Research
Department for Business,
Innovation and Skills

BIS, the Department for Business, Innovation and Skills, was formed in June 2009, putting science and innovation at the heart of building Britain's future with a sustainable economic recovery. In this new departmental structure the research base has not only retained existing close contacts with higher and further education, innovation and the Government Office for Science, but now has the opportunity to exploit closer synergies with the business agenda.

The ring-fenced budget for science and research has doubled in real terms since 1997. BIS funding this year is of the order of £5.6 billion, £3.2 billion of which is distributed through the seven Research Councils. Around half of this is allocated as grants for PhD studentships and peer-reviewed research projects, much of the remainder supporting large capital facilities in the UK such as the Diamond Light Source synchrotron in Oxfordshire and

membership of international programmes such as CERN and the European Space Agency. Another £1.5 billion is distributed directly to English higher education institutions through HEFCE, currently allocated on the basis of the RAE measure of research excellence. The Science and Research Budget also includes allocations for knowledge transfer, the three National Academies and the devolved administrations. This public funding for basic research and infrastructure underpins the excellence and international competitiveness that levers in significant further national and international research funding.

So what do we get in return for this investment? Crucially, it underpins a strong, internationally competitive research base. Independent analysis shows the UK to be currently second in the world (behind the USA) in both overall number of peer-reviewed publications and number of citations. The UK tops the G8 in number of citations per researcher and number of citations relative to research spending. The importance of our global competitive position cannot be emphasised too strongly. Just as we have increased our spending, so have many other countries – China and India in particular have

greatly expanded their investment in research in recent years.

The UK receives major economic, social, health and cultural returns from the research base. We get direct economic return from the creation of new businesses and contributions to greater productivity in existing companies, the strength of the research base being a magnet for inward R&D investment. In addition, we generate for the economy and society a supply of highly educated and skilled individuals, create cultural capital and tackle key societal challenges around energy, the environment and the health of the population.

The 10-year Science and Innovation Investment Framework, 2004-2014, reflects a Government commitment to treat research spending as a long-term investment, with Government setting broad-brush strategic priorities but with detailed funding decisions made on the basis of peer group judgement of research excellence. These commitments have recently been reaffirmed by the Prime Minister as critical to the UK's plans for post-recession recovery. In recognition of the need for stability, the Science Budget has been ring-fenced by successive governments for the last 35 years.

Whilst recognising the absolute need to protect long-term blue-skies research, the Funding Councils seek, where appropriate, to encourage academia to be more outward-facing; for example by promoting knowledge and technology transfer activities and

... In recognition of the need for stability, the Science Budget has been ring-fenced by successive governments for the last 35 years. . .

by rewarding rather than hindering business engagement in universities' internal promotion criteria. The resulting culture change has contributed to the UK's overall knowledge exchange income doubling since 2001 and the UK leading Europe in inward R&D investment, and in the numbers of university spin-out companies created.

The challenge now is to maintain research excellence in the face of tighter public spending. In part this requires us to ensure that quality research is exploited efficiently, so that the taxpayers who fund it share in its returns. The RAE, currently the basis of the allocation of HEFCE research funding, is set to be replaced by the REF, which will reward both excellence and the impact derived from it. This agenda does not conflict with the need to invest in blue-skies research and to continue to support areas of research that have no obvious short-term non-academic impact. What matters is that opportunities are not missed, whenever and wherever they occur, for harvesting economic and social benefits from research current and past.

The research base is central to the New Industry, New Jobs agenda, especially through the funding councils' growing joint agenda with the Technology Strategy Board, which brokers links between academia and business and industry. The TSB's Knowledge Transfer Partnerships allow graduates to complete an industrial project, for example designing a new product or strategy, with academic support. 70% of these partnerships between graduate and business turn into a full job. The department is also working hard to strengthen partnerships across Whitehall and communicate regularly the

contribution Science & Research makes to BIS and government-wide objectives.

High-level skills are vital for the UK and at Lord Mandelson's request I am currently leading a wide-ranging review of postgraduate education, to report in Spring 2010. We will assess the benefits of postgraduate study to individuals, universities, the economy and wider society and explore ways in which postgraduate study can better meet national needs. The review will assess the competitiveness of UK postgraduate education in the international market and ask how we can ensure the UK remains an attractive option for the brightest and best internationally mobile young researchers. We will also analyse current levels and patterns of social participation in the UK.

It is increasingly important to see UK future strategy within an international context, especially in respect to the EU, where planning is already in train for the 8th Framework Programme for Research and Technological Development, which will take effect from 2014. The current, 7th Framework Programme, running from 2007-14 has a total budget of around €50 billion, of which some €1 billion per year has been flowing to the UK. It is important, therefore, that we engage at an early stage with the development of the themes and funding mechanisms of the next Framework. The EU is also a key player in the funding of large international projects such as the ITER experimental fusion reactor, which will be built in southern France and may be a critical breakthrough in producing large-scale clean energy.

The research base obtains further international leverage and connectivity through the Science and Innovation Network.

. . . The space industry is a flourishing, research-intensive sector of the UK economy with satellites playing a key role both in operational telecommunications and scientific research.. . .

This is a joint activity between the FCO and BIS, with 90 staff across 25 countries acting as a catalyst to bring UK academics together with overseas academics and businesses in pursuit of the Government's overseas science policy priorities. The network helps the UK to stay regularly updated on research policy developments around the world and, where appropriate, to try to influence the formation of other governments' science policies.

Research base influence also extends to outer space. The space industry is a flourishing, research-intensive sector of the UK economy with satellites playing a key role both in operational telecommunications and scientific research. It is also highly internationalised, with the potential to generate strong levels of public interest. For these reasons, the Science Minister, Lord Drayson has recently announced his intention to create a UK space agency to co-ordinate and present a higher profile for these activities.

Another area in which Science & Research plays a key role is the relationship between science and society. It is in everyone's interest for there to be a strong connection between scientists and the wider world.

We are all major stakeholders in scientific research as citizens and taxpayers. The UK's leading position in science depends on a supply of qualified people and an environment of public awareness and support. We have set up five independent Expert Groups to develop future plans to improve this relationship.

Finally, in addition to the already excellent science communications work taking place in the UK, we have launched the "Science: [So what? So everything!]" campaign, which is designed to widen participation beyond those targeted through conventional channels. This activity is estimated to have reached 24 million people so far. Extending messages at grass-roots level is National Science and Engineering Week, which in 2009 inspired 3,500 regional events. To maintain excellence and tackle global challenges ahead, it is important that we inspire the next generation of scientists and academics. This campaign is increasing awareness of science especially among young people, who may well take up STEM-based careers in the future.

THE CHALLENGES FACED BY MICROBIOLOGISTS



Professor Geoff Hanlon
President, The Society for
Applied Microbiology

If one was to ask workers within the NHS to indicate the most pressing issues they face, one thing towards the top of their list will be controlling healthcare associated infections. In a similar vein, if one asks patients about to enter hospital what they fear most about their impending therapy, they will probably say contracting an infection such as MRSA or *Clostridium difficile*. With microbiological issues forming such a central focus in the clinical setting it is rather surprising to find that the amount of microbiology taught within the current curricula of both medical and pharmacy undergraduate degrees is pitifully small. Furthermore, teaching the important practical aspects of microbiology on any course is severely hampered by financial constraints.

The Society for Applied Microbiology is the oldest microbiology learned society in the UK. It was formed in 1931 originally as the *Society of Dairy Bacteriologists* which itself was established by the Ministry of Agriculture's appointed Advisory Dairy Bacteriologists. These were microbiologists whose role was to provide instruction on the hygienic production of milk, which in the period following World War I was woefully poor. Sometime after establishing the *Society of Dairy Bacteriologists* the remit of the society expanded and the name was changed to reflect this, firstly to the *Society for Applied Bacteriology* and finally to the *Society for Applied Microbiology*. Today the society has in excess of 1,500 members in over 80 different countries and its objectives are 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.

In this context the science of applied microbiology covers such areas as:

- Health
- Medicines production and quality
- Food safety
- Water quality
- Environmental protection

It is clear, therefore, that microbiologists are involved in a far wider agenda than just the challenges of antimicrobial resistance and healthcare associated infections outlined in the first paragraph. I will attempt below to give a flavour of the different issues facing microbiologists at the present time and try to indicate that these are not merely academic problems but issues which impact on all of us in a most profound manner.

CLIMATE CHANGE

Bacteria are the most abundant free-living organisms on earth and countless billions

of them live in our vast oceans. The role they play in biogeochemical cycles and their part in influencing carbon dioxide levels and hence climate change is not well understood. Even less well understood is what impact rising ocean temperatures and changing acidification will have on the functioning of this gigantic biome. There is a clear need for more work in trying to understand the complex interactions which lie at the heart of this problem so that we may be more able to deal with the issues arising from climate change.

INFLUENZA PANDEMICS

In the influenza pandemic of 1918/19 over 40 million people died worldwide; a staggering number which overshadows even the HIV tragedy. With this backdrop the concern over the recent swine flu pandemic is understandable as a new strain of H1N1 virus emerged. However, swift responses on the

part of politicians and microbiologists have put in place systems to limit its impact. We still do not know what awaits us over the coming months but the role of applied microbiologists in the areas of epidemiology, identification, vaccination and treatment will be paramount.

FOOD SAFETY

The Advisory Dairy Bacteriologists appointed by the Ministry of Agriculture just after the first world war were engaged in turning around the parlous state of the dairy industry at that time which impacted on both economic and health issues. Today, that industry is in great shape, at least from a food safety perspective, but that is not to say that problems do not exist elsewhere. The globalisation of the food market, increasing use of minimally processed foods, the desire for organic food production etc, all present microbiological challenges. Recent cases of *E coli* O157 outbreaks in the UK have focused our attention on this issue and highlight the fact that we take our eye off the ball at our peril.

GLOBAL HEALTH ISSUES

Developing countries are facing a number of health issues including TB, HIV, malaria and cholera which are still major causes of mortality and morbidity in these areas of the world. These are often linked to infrastructural issues such as the supply of clean water and appropriate disposal of sewage waste, but health education issues are also relevant here. In attempting to address these problems the participation of scientists and technologists throughout the world is now recognised as being pivotal. However, in many developing countries it is necessary first to build up local scientific, particularly microbiological,

capacity to enable them to address their specific local issues and ultimately to develop sustainable economies.

THE ROLE OF LEARNED SOCIETIES

Learned societies bring together like-minded specialists to enable them to share their expertise. The *Society for Applied Microbiology*, for example, publishes five microbiology journals reporting on research in all aspects of applied microbiology. These journals are available free to members and allow them to keep abreast of developments in their field. The society also organises three major meetings and awards over £150,000 of grants each year.

It is important for such organisations also to act as a voice for their subject discipline, particularly attempting to influence policy makers on matters of importance. This might include putting the case for more microbiology to be introduced into clinically related undergraduate courses or more money to be made available for the effective teaching of microbiology laboratory skills. In our case one vital function is to communicate effectively the science of applied microbiology to the general public and the media. In this context we work with representative bodies like the *Society of Biology* (recently formed by the amalgamation of the *Institute of Biology* with the *Biosciences Federation*) and organisations such as the *Science Media Centre* and advocate one policy voice for the Life Sciences or Biological Sciences (to include microbiology).

Our society, like other learned societies, has members engaged in day-to-day work within microbiology laboratories in academia, the NHS, other government-funded

...microbiologists are involved in a far wider agenda than just the challenges of antimicrobial resistance and healthcare associated infections...

organisations and industry. These people are at the cutting edge in dealing with issues such as those described above. It is vital that there are continuous professional development schemes appropriately funded for such scientists working in the microbiology arena.

INTERNATIONAL CAPACITY BUILDING

At the UN Millennium Development Summit in 2000 the Heads of State from Governments across the world agreed to work together to achieve a more prosperous international community. From this summit a number of Millennium Development Goals were drawn up leading to multi-million pound capacity-building initiatives co-ordinated by, among others, the World Bank and, in the UK, by the Department for International Development (DFID).

There is no doubt that large initiatives such as these do play a major role in delivering the global development agenda. However, they are often very inflexible and in many cases the most significant impact can be made by individuals carrying out small scale interactions on a personal level. This suggests that learned societies can embark on capacity building projects in developing countries on a smaller scale but make a real difference to individuals on the ground. Societies such as the *Society for Applied Microbiology* are ideally suited to contribute to this agenda since our members are specialist scientists covering

an extended network of over 80 countries and with strong links at grass roots level.

Examples of potential interactions include:

- Setting up collaborative research projects
- Donation of equipment, journals or textbooks
- Laboratory training in UK for overseas young scientists
- Lecturer/student exchange
- Organising meetings/training workshops in developing countries
- Assisting schools/universities with accreditation or curriculum design
- Expert advice on local problems
- Assistance with grant or paper writing
- Help with forming "sister" learned societies

In conclusion, applied microbiologists are engaged at every level in dealing with some of the most important issues facing us at the current time. Learned societies are there to support them in their endeavours and to push these issues further up the political agenda. In particular they are there to highlight the vital role played by this often-overlooked group of specialists. It is essential for the long term prosperity of the UK that sufficient resources are available to support applied microbiology so that the challenges we face can be adequately addressed.

SCIENCE AND ENGINEERING AT THE HEART OF HEALTH AND SAFETY



Judith Hackitt CBE
Chair, Health and Safety Executive

The mission of the Health and Safety Executive (HSE) is the prevention of death, injury and ill-health to those at work and those affected by work activities. For the organisation to achieve its mission requires commitment and action from many other organisations and in HSE itself we employ a wide range of scientists and engineers to:

- conduct workplace inspections and conduct forensic work for accident investigations
- acquire scientific safety evidence and knowledge on new developments and technologies related to health and safety
- apply this evidence and knowledge to regulation, policy, guidance, standards and enforcement methods
- evaluate and disseminate the results of research

SCIENTISTS AND ENGINEERS IN HSE

HSE employs around 3500 people of whom about a quarter are practising scientists and engineers. This makes HSE one of the major employers of science and engineering specialists within Government. The majority of scientists and engineers work in one of four locations: HSE's Bootle headquarters, the Health and Safety Laboratory (HSL) in Buxton, and in two of the regional offices, York and Aberdeen. Some work as Specialist Inspectors alongside HSE inspectors, based in offices throughout Great Britain.

In policy work, our specialists use their knowledge and skills to help identify new and emerging health and safety problem areas, using their experience and commissioning research to develop solutions. In a changing world, they are able to keep up to date with new developments and technologies, and ensure that people can manage emerging risks whilst at the same time enabling innovation and business development throughout Great Britain.

Setting targets for work-related ill-health and implementing actions is complex. Some ill-health is clearly work-related, with long-latency in certain cases. Other causes of ill-health are not solely work-related or their seriousness may be exacerbated by non-work-related factors. Our specialists engage in work to

identify health priorities and establish the most effective solutions.

Incidents such as the explosion at Buncefield highlight the importance of controlling risks from major accident hazards. Many of HSE's specialists focus on assuring safety by assessing safety cases prepared by businesses and conducting inspections to regulate offshore and onshore chemical and nuclear activities. Their knowledge, skills and professional standing within their respective industries are essential to the successful management of ongoing and emerging issues. Part of our role as regulator is to provide advice and guidance to assist dutyholders in effectively controlling the risks their activities inevitably create. This requires us to attract and retain people of the right calibre who can work alongside industry specialists from many disciplines.

Controlling risks at source has long been a cornerstone of HSE's approach and is an important tool in the supply chain for chemicals and new products. HSE's specialists play a leading role in establishing the national and international framework for regulating the supply chain, carrying out the reviews and assessments on which the approvals are based.

As laid out in the new Health and Safety Strategy, inspection, investigation and enforcement are also key elements of HSE's

regulatory approach. Our specialists provide the expertise to support these activities. Of the thousands of inspections and investigations each year, a significant proportion require particular science or engineering knowledge to identify the causes of problems and to identify solutions which meet the key criteria of being reasonable and practicable. These specialists come from over twenty disciplines including mechanical, chemical, electrical and construction engineers; occupational health and hygiene specialists; and radiation, noise and vibration, and human factors specialists. They are the eyes and ears of HSE's science and engineering community, providing valuable intelligence about particular customs and practices in and across a range of industries. A continuing challenge for HSE is to collect, collate and use this corporate knowledge effectively.

RESEARCH

HSE currently funds about £36.5m of scientific and technical work, mostly in support of its inspections and investigations. Around 30% of this funding is spent on health and safety research.

HSE commissions applied research to provide independent scientific advice for our regulatory purposes, particularly where employers either lack the relevant scientific and technological expertise or where they require new ideas to stimulate improvements.



Our agency laboratory (HSL), conducts most of this research because it is the national focus for occupational health and safety research. However, we also use academic and third party organisations to undertake a range of research, and we seek joint funding where possible. Some costs are recoverable from industry, such as the offshore oil and the nuclear energy industries.

A few recent examples of research work supporting changes of approach in managing health and safety at work include:

- changing the management regime for tower cranes following a number of recent collapses;
- developing management guidance to avert explosions in fuel storage depots following the Buncefield explosion and fire;
- conducting research into workplace cancers to help identify priorities for addressing future cancer burdens; and
- developing workplace stress management standards.

It is important to note that while some of HSE's research is in response to events, other research projects are commissioned to support the new Health and Safety Strategy, including work on long-latency disease following exposures to asbestos and silica. Evaluation of leadership, competence, worker involvement and the impact of health and safety interventions

are other important parts of HSE's research priorities.

In conducting research to inform the evidence base for policy, HSE stresses the need for researchable questions. HSE's Chief Scientific Adviser ensures that HSE policy staff are trained to appreciate how to make best use of evidence from scientific research and analysis. This in turn helps policy staff commission projects better, make suitable arrangements to evaluate results and demonstrate the impact and utilisation of research.

In addition, HSE uses a Futures Team at HSL to identify emerging issues which are likely to have an impact on health and safety in Great Britain within the next 10 years. Horizon scanning is used to help identify the need for research into topics such as emerging energy technologies, ageing industrial infrastructure, and obesity in the workforce. A recent example has been HSE's research into nanotechnology – commissioned five years ago as a horizon scanning topic, which has led to contributions to the Government's nanotechnology strategy and to codifying the knowledge for health and safety inspectors.

HEALTH AND SAFETY LABORATORY (HSL)

HSL undertakes scientific support and investigation work for HSE, as well as for other government departments and for private sector organisations. This cross-sector position means that HSL is ideally placed to

make a strong contribution to the overall health and safety system in Great Britain, by spreading best practice. This is complemented by HSL's high international standing and is active in a number of worldwide networks, which aim to ensure consistency of approach through knowledge sharing and collaborative projects.

A significant feature of HSL's position relates to the safe and healthy implementation of new technologies, helping enable Great Britain to remain at the forefront of such advances. For example, the 'green economy' is a key element of our future economic development: HSL has been working with industry and Government to ensure that the hazards and risks associated with these new approaches are considered early enough in their development to ensure safe and successful implementation of these important and innovative developments.

A topical area, where this is particularly appropriate, concerns carbon capture and storage (CCS). Although most processes within the CCS chain can be effectively regulated under existing legislation, there are some important gaps which need to be addressed before an appropriate safety regulatory regime can be successfully implemented. HSL is working with various organisations, including HSE and the International Energy Agency, to identify potential hazards at all stages in the CCS system from capture to storage, and to determine how regulatory and knowledge gaps can be appropriately filled.

Another example concerns alternative fuels, which may pose health and safety risks if certain issues are not adequately addressed. HSL has conducted work for the Department for Transport on hydrogen fuels and

biofuels to identify the knowledge and data required to develop fully a risk assessment for a hydrogen delivery and storage infrastructure. A current project is looking at vent stack design for emergency release of hydrogen from storage systems to understand how these systems can be used safely in urban areas. The work is carried out under the umbrella of the International Energy Authority Hydrogen Implementation Agreement, and is funded by HSE and a number of private sector organisations.

HSL's scientists are also working on approaches to improve human capital performance for businesses and organisations. For example, HSL's development of the stress management standards for HSE showed how a complicated workplace issue could be managed effectively through the application of a simple, practical tool. HSL is now developing a similar approach in the area of workforce wellbeing. In essence, this is about providing employers with more support to create 'healthy organisations' that provide the necessary conditions for innovation, job/life satisfaction and improved productivity. As this work progresses and generates more information, a benchmarking service is envisaged.

Scientists and engineers play a hugely important role in helping HSE to perform its role in preventing death, injury and ill-health in workplaces throughout Great Britain whilst at the same time ensuring that Government and business priorities are taken into account. We do this by being proactive and flexible so that we can adapt to changing needs and ensure that we enable others to innovate and grow Great Britain's economy, safely.



Buncefield Tanks

FOOD SECURITY, INNOVATION AND INDUSTRY



Peter Blezard
Founder and CEO Plant Impact plc

The global demand for food is increasing because of growth of consumption in our increasingly large global population. This, combined with increasing competition for land, water, energy, other limited resources, and the impact of climate change, is creating a major challenge for governments and the agro-industry to ensure we can provide both the necessary quantity and quality of food on the table for everyone, without further damage to our environment. This is a challenge of unprecedented proportions because it requires innovation and change in many aspects of our way of life – which is why John Beddington, the Government Chief Scientific Adviser, refers to it as the “Perfect Storm”.

Innovation and subsequent development of appropriate technologies that are safe, affordable, rely less on our limited natural resources for their manufacture (such as gas and oil), assist in mitigation of greenhouse gases, cause less environmental degradation and reduce the rate of loss of biodiversity are seen as key components of a global strategy for food security. In addition to all this, technologies that meet these criteria must be available sooner rather than later – 15 or 20 years to develop new technologies may be too late. Sadly, few traditional agricultural inputs meet these criteria and even new agri-biotechnological solutions are considered by many as unsafe and themselves a threat to sustainability. Also development times and regulatory requirements for many GM crop introductions preclude them from providing more immediate solutions even if UK research, field trials and commercialisation geared up to this end from this point in time.

A 2009 report entitled *Agrochemicals: Working for the future*, based on a House of Lords discussion sponsored by Plant Impact plc in November 2008, concluded that the regulatory demands and the fury of the negative consumer lobby against technology in agriculture was out of all proportion to the risk that attends its use, and that innovation in agriculture had suffered as a consequence. The participants from government, academia and industry considered innovation to be crucial to our ability to address

existing and key future issues that will arise due to climate change.

Innovation is certainly necessary to ensure global food security and while innovation can arise in many forms, the development of new technologies is largely dependent on our research capability in academia, national institutes and industry. One of the frustrations with UK science and how it is supported, however, is that we too readily focus on the latest state of the art techniques, always looking here first for the magic bullet or as a panacea when solutions are needed to our most challenging problems. This is part of the explanation for why GM crops are emphasised as a solution to our current food security needs. Within agriculture, biotechnology and transgenic crops have been largely seen as an alternative to conventional development and use of agrochemicals. Despite the disadvantages of a poor public perception to many of these GM products, they have the potential to be safer and in some ways more environmentally friendly than many conventional agrochemicals. It is clear that transgenic crops are going to be part of the armoury of technologies necessary if the world is to feed its growing population. Innovation, however, takes many guises other than the latest methodological approaches, such as GM crops, and it is perhaps here that we will find the solutions in the short to medium term to address some of our most pressing needs.

Sir James Dyson, one of our country's leading inventors and entrepreneurs, has forcefully argued that there is always a need to “Ignore the perceived wisdom of the era ...” and talks about the need for “entrepreneurial” and “creative rule breakers” and “inventive engineers”. Britain has a long tradition in such creative engineering – which goes back centuries. However, the ability to develop something to meet a specific market need has sadly been relegated to the lower divisions of scientific endeavour because it is considered less sexy, less high tech – not at the forefront of the latest panacea. Much of UK science is carried out as if we were trying to build a bridge across a ravine for which we have no dimensions or understanding of load bearing requirements – we all too rarely define the market before we embark on science to develop a technology – in ways that are second nature to engineers.

Designing products fit for purpose, ie scientific innovation for the market place, as opposed to science to research a problem, is the approach pioneered by Sir James Dyson in the household appliance market. He looks at the market and decides what it is that really meets customers' needs and then designs products to meet those needs. The approach involves two elements – firstly understanding the market and secondly being able intelligently to design a product. In this context 'design' is not about how something looks but rather how something works – good design evolves from function.

For agricultural inputs, intelligent product design means developing technologies which assist mitigation and our adaptation to climate change, and are sustainable, safe, economic and environmentally effective – by design – right from the outset. This is the market in which we now have to exist and this has to be the whole basis on which products now and in the future will need to be developed.

This is the approach which Plant Impact plc has adopted and the following examples demonstrate how it is possible to use product design to address key issues for food security. If, for example, we wish to increase the nutritional value of harvestable crop products while decreasing wastage in storage and improving the ability of the crop to withstand drought stress and a whole range of



physiological disorders whilst growing in the field, then some may consider it necessary to breed a super crop plant. The alternative, however, is much more innovative and involves simply improving plant cell integrity through delivery of a calcium input formulated in such a way that the nutrient is able to reach all of the key parts of the plant while it is growing – something we have consistently failed to do with calcium inputs since their first use.

CaT is Plant Impact's calcium technology which is uniquely formulated with an analogue of a plant hormone which draws

the calcium into the plant and moves the nutrient from cell to cell within the plant – CaT is the world's first calcium input to achieve this. It is more effective than current calcium options moving calcium 20-25 times faster and in doing so creates higher calcium content of key food products, healthier, higher yielding crops, tolerant to abiotic and biotic stresses while retaining their quality in storage as well as lower farmer operating costs and improved profitability.

Nitrogen fertilisers are another area desperately crying out for innovation. The way we use nitrogen is like using a sledgehammer to crack a nut and sadly nothing has changed in 50 years. The cost of production of nitrogen is linked to natural gas production and hence costs fluctuate in line with gas costs. Also the means by



which nitrogen is delivered to the plant is incredibly inefficient leading to release of the greenhouse gas, nitrous oxide, and leaching of nitrates which contaminate our waterways and oceans. Plant Impact's PiNT is a unique controlled nitrogen release system that ensures that nitrogen is taken up by the plant in its most useful form as amines and ammonia and reduces the amounts released as nitrous oxide and converted to nitrates by soil micro-organisms to leach and contaminate waterways. PiNT improves plant growth, produces higher yields and is

environmentally sustainable; a nitrogen product that is innovative and designed for our 21st century needs in agriculture.

Effective safe chemical pesticides – those that are safe for the user to apply, safe for the environment and for the consumer are rare and yet there is an increasing need for such products that can make a contribution to sustainable agriculture, maintaining biodiversity and not damaging human health. Bug Oil, another of Plant Impact's range of products, is based on a novel mix of harmless plant oils which when combined make a highly effective (equal to its chemical pesticide equivalent) and incredibly safe green pesticide that controls some of the world's most harmful insect pest species on our most important crops – whiteflies, aphids and thrips through both a preventative and curative action.

These examples illustrate that we do not have to seek the magic bullet or methodological panacea, but through the use of the James Dyson approach – the intelligent design of products – it is possible to develop technologies from scratch, based on a sound knowledge of the market and the plant and animal physiology that do not have political, public or environmental drawbacks and can be developed in a time frame relevant to our current pressing needs. However, as the House of Lords discussion on the future of agrochemicals highlighted, if companies such as Plant Impact plc are to make a full and proper contribution to addressing food security in an era of climate change and declining natural resources, then governments need to have a key role in enabling and facilitating that involvement. Specifically, there is a need for a

faster track for registration of products (not a lesser process but a faster one) so that technologies which clearly address mitigation, adaptation to climate change and improved sustainability are prioritised for evaluation and processed quicker – not least because many of such new technologies are coming from small companies who cannot afford, in cash flow terms, to wait three years for a registration.

There is also a need for a re-prioritisation of research funding with greater emphasis on market-led innovation, rather than our outmoded commitment to serendipity, ad hoc processes for commercialisation and a fear of near market research, in short a commitment to a new age of UK innovation through design in support of our most innovative companies.

Food security as an issue also has to be prioritised throughout government, for example through a commitment to ensure that companies with innovative technologies which address food security and climate change are prioritised for export support. There is also a need for greater involvement of the agricultural industry in initiatives such as the Defra Sustainable Development Dialogues.

UK companies have a crucial role to play in addressing global food security but will only be able to deliver properly through co-operation and partnership with government, academia, the media and the public to ensure that innovation through design is part of the equation, and companies developing such technologies are given the opportunity to make them globally available.

REPRESENTING OUR SCIENTISTS



Andy Boseley
AMPS Workplace Representative

So you think trade unions are not for professional scientists? You could be surprised to find out what is really happening to those in white coats (and are not taking you away!)

Trade Union Membership in the United Kingdom fell into a rapid decline from the late 1970s through to the end of the 1990s but since this time it has remained reasonably constant at about 7.5 million members. We can only speculate the reasons why this decline has occurred and indeed why it has levelled out. One suggestion that is often put forward is that over this period the composition of the workforce in Britain changed; there was a gradual shift from a strong manufacturing base to one focused on service sectors. As the number of employees in industries typically regarded as 'blue collar' has decreased, the number in so-called 'white collar' roles increased. And with

a commonly held belief that Trade Union Membership in the white collar sector is frowned upon this has caused the demise of trade unions.

However in the latest trade union membership statistics survey¹ published by the Department for Business, Enterprise and Regulatory Reform, in conjunction with the Office for National Statistics, this belief is shown to be unfounded! The survey dispels the myth that 'professionals' are not interested in Union Membership. It found that for all employees, union density was highest in professional occupations at 44.3%, compared to only 23.3% in skilled trade occupations. So how does the Trade Union movement help this cohort of employees? The larger unions, such as Unite, undertake steadfast work providing the services required by the membership they represent; however members within professional occupations often shy away from the more confrontational style of Trade Unionism. This is where Trade Unions such as AMPS, the Association of Managerial and Professional Staffs, help to fill the gap.

AMPS is a growing, non politically aligned trade union association whose main aim is the enhancement and protection of its members' terms and conditions. It has a rich history of serving members of the chemical and allied industries that goes back almost a hundred years. More recently,

its remit was expanded to serve professional divers, especially those working in the North Sea Oil fields. Its membership really blossomed in the late seventies as it represented the professional scientists within the old ICI organisation; today it represents professionals and managers in over ninety different companies.

Like all employees, when things go wrong at work, professionals need a safety net! AMPS aims to provide this reassurance by minimising confrontation within industrial relations by encouraging the use of independent arbitration when serious disputes arise. There is a firm belief that the interests of members are best served through consultation and negotiation. The Association is fully committed to equality and fairness for all and we are wholeheartedly committed to looking after our members whatever their role.

AMPS is one of a number of small but specialised trade union associations that serve a growing number of professionals. Many of these, including AMPS, are members of the Federation of Professional Associations, which is a sector within the large Unite union. As Unite is the largest union in the United Kingdom, with almost 2 million members spread across most industries, the relationship enables AMPS to provide the best of both worlds; it is small enough to care, but large enough to protect. Whilst retaining its autonomy within Unite, AMPS can still call on the massive

resources available to Unite to provide unparalleled levels of benefits and security for its members.

In addition to its supporting role, AMPS helps the voice of scientists to be heard in the wider community. Members of AMPS regularly meet with the Parliamentary and Scientific Committee to ensure that the views of our members are heard respectfully within Westminster. The Association also has strong links with other like-minded organisations abroad. In the European dimension, AMPS was a founder member of FECCIA (European Federation of Managers in the Chemical and Allied Industries). This combines organisations representing managers and professionals in the chemical and allied industries of France, Germany, Italy, Spain, and the UK. Within FECCIA, common areas of interest and ideas are shared helping to provide unified responses to EU consultations and legislation.

So, if you feel that it is time you needed a little independent help, advice or support when dealing with your employer, remember this: many, many professionals are already members of a trade union; you are not bucking a trend, just joining the happy throng of people already enlightened.

There are many associations, such as AMPS, which can help provide you with protection in the manner you require. If you are a professional member of the scientific community log on and register with www.amps-tradeunion.com to receive further information.

¹ See <http://stats.berr.gov.uk/UKSA/tu/tum2008.pdf> April 2009

... union density was highest in professional occupations at 44.3%...

WHAT'S THE POINT OF A TRADES UNION?



Marijke Smith
President, Association of
Management and Professional Staffs

Why should we bother with Trades Unions at all? Do they serve any useful purpose?

Traditionally, Trades Unions were there for just that – Trades. They were built out of the necessity to gain better pay and conditions. It wasn't seen to be 'right' for Managers to have the same needs as other workers – after all, they were salaried and weekly paid staff could be laid off with less hassle. How times change. Our employment base is dramatically altered and our workforce is now mainly salaried and monthly paid. Proportionately fewer of us are paid in cash weekly in 2010 – but many of us remember fondly the feeling of that little brown envelope on a Friday lunchtime.

However, everyone these days is familiar with appraisals, employer/employee policies, performance measurement, gradings, capabilities, competencies and many more ways of ensuring that you are meeting the bottom line. As always, this is about human beings dealing with human

beings and personalities and temperaments are sometimes problematic. Every one of us is being measured in our workplace. We may not be aware of it in some cases; in others it intrudes – regular appraisals are an endurance test for large sectors of workers of all levels. Some commentators have unkindly noted that the recession has enabled some employers to get away with trimming the workforce and calling it recession-proofing.

This greater concentration on measurement of all employees means that all of us, whatever grade we are, sometimes need an independent voice when a problem arises at work. We specialise in management/graduate grades and have broad expertise in just these issues. How do you meet a competency? What is the difference between a capability and a competency? Answer: not a lot – it really depends on your point of view. What does matter is that you meet it in the required manner, and that's where the skill lies, in meeting the needs of the measurement in a way that satisfies everyone.

What can happen is that your understanding and that of your line manager or reportee differs.

Take this following example of a capability:

Actively promotes or participates in or creates unique opportunities that build and encourage the business.

The difference in interpretation is very wide, what is a real opportunity to a risk taker is foolhardy to one who is risk averse, despite demonstration.

Consequently, if you add in a personality clash you can see on the one hand this may be a very competent employee or someone heading for a disciplinary.

Unfortunately, many of us tolerate situations where small incidents are smoothed over or excused and not addressed. It becomes like water on a stone and finally one day becomes a raging torrent which can no longer be tolerated or endured. The time to seek advice is as soon as you perceive a problem, not the day before the disciplinary hearing. Trades Union representatives have generally heard and seen most things – and are very capable of spotting those who have perhaps not fully subscribed to the fair day's work for a fair day's pay. We specifically exclude here presenteeism (where people spend endless hours in the office because they are too scared to be seen leaving/arriving at the usual hours). It is fair to say that if the best course of action might be to seek alternative employment then your representative will not shy away from telling you how it is. They can usually see a dismissal coming from some distance. We have been known to summon the cavalry when required and can safely say that we have, on the odd occasion saved lives by being there and delivering assistance to distressed employees.

A Trades Union is there to assist the employees and

employers continue a harmonious working relationship. It is a two way street and negotiation always works better than confrontation. However, intransigence does sometimes occur on both sides and it does need to be worked through. Sometimes this can be more straightforward than others and skilled Union negotiators can be of great benefit in finding an appropriate result. The benefit of the independence of the Trades Union is that they can see from an impersonal perspective – it's not their reputation or bonus on the line and can frequently negotiate an alternative path. Unfortunately the cases that make the media headlines are always those where misunderstandings on both sides have led to greater problems – the ones where all goes smoothly and major issues resolved amicably don't get reported. Bad news always sells better than good.

It must be added that Trades Unions are also involved in negotiations for pay and conditions. Unions are involved in making sensible proposals that will enable the company to remain profitable but ensure the workforce is suitably rewarded and to manage the employees' expectations when the company falls on hard times.

So what's the point of a Trades Union? We are there to be mediators when two parties fall out to ensure a satisfactory solution that is agreeable to both parties.

... this is about human beings dealing with human beings ...

SCIENCE AT THE BRITISH COUNCIL



Martin Davidson
Chief Executive Officer,
British Council

Science, technology and innovation are cornerstones of the UK's creative and knowledge economy. As a country we rightly take pride in the achievements of our scientific community and for the last 75 years the British Council has promoted the UK's excellence and contribution as a respected global partner and leader in the field.

The British Council's purpose is to build engagement and trust for the UK through the exchange of knowledge and ideas between people worldwide and we call this cultural relations.

Cultural relations provides a platform and a space for people to find common ground and, like Education, science has the capacity to reach across divides, nurture innovation and foster understanding. That is not to suggest that cultural relations blindly assumes agreement at each stage or that people will shelve their own beliefs, but our starting point – as an organisation, and as, I believe, a country and society – is a broad

acceptance of scientific proof whether discussing climate change, pandemic illness or evolution.

Take 'Darwin Now' as an example. This is our global cultural relations contribution to the celebration of the 200th Anniversary of Charles Darwin's birth and, of course, the 150th Anniversary of the publication of 'On the Origin of Species'.

Our objective with Darwin Now is to look at the impact of Darwin's theory of evolution on contemporary biology, medicine and society. We are inviting people to ask the question, "What is the relevance of evolution to me, to my life and my society?" Our belief in the power of exchange of knowledge and ideas requires us to consider what kind of conversation we need to have with people from cultures who hold other perspectives and beliefs. We do not presume that our truths are more truthful, but any dialogue of this nature cannot be values-free if it is to be meaningful, and progress will not happen without it.

What Darwin Now does demonstrate is the power of science as a co-operative force for good not only amongst expert practitioners, but also wider publics. We have seen more than 6 million people in 44 countries

take part in Darwin Now over the last year which manifestly underpins the relevance of science to the international and cultural relations conversation.

In promoting international scientific co-operation, the British Council's vision is for a widespread recognition of the role that science, engineering and technology can play in helping to extend our understanding of the world and develop imaginative solutions to shared problems.

In the current economic environment, each of us recognises the vital role that science and innovation has to play in securing long-term prosperity. Like higher education, science and innovation must continue its drive towards systemic internationalisation if the UK is to consolidate and build on its position as a world leader and a global partner.

Key to this is the engagement of the scientists themselves and wider publics, particularly young people. In order to reach both of these audiences, we work in partnership with policymakers and scientific administrators both in the UK and in-country, on common objectives. For the scientists, the exchange of knowledge and ideas is through instruments that promote mobility of researchers and contact-making such as workshops, seminars and laboratory exchanges. For the public, exchange is through instruments that promote science communication such as public talks and debates, events and exhibitions.

**... science has the capacity to reach across divides,
nurture innovation and foster understanding. . .**

For example, 'Mediterranean Innovation and Research Co-ordination Action (MIRA)' is a project that aims to create a platform for dialogue using state-of-the-art ICT, enabling discussion between researchers and innovators from both sides of the Mediterranean. It will connect and improve the dispersed, existing scientific initiatives for co-operation supported by the Member States, the European Commission and other political bodies, and provide training to raise the quality of participation by Mediterranean partners in European research programmes. A series of workshops and meetings will identify thematic priorities of common interests, and the project will create a Euro-Mediterranean 'observatory', to agree indicators for the monitoring of research co-operation. Finally, it will create a network of research and development actors from both sides of the Mediterranean. All these activities are aimed at providing a strong inter-institutional basis for collaboration.

Our 'Women in Science' project produced a brochure and website featuring twenty-two leading women scientists in the UK. We used a young fashion photographer from Manchester to take portraits of the women in settings other than the laboratory and commissioned a journalist to write short pen portraits for each woman. There were three specific messages, for three different target audiences: firstly, to highlight the valuable contribution that UK women are making to pushing forward the frontiers of science, engineering and technology; secondly, to encourage more UK women scientists to be invited overseas as ambassadors for UK science; and thirdly encourage policymakers overseas to become more interested in the

issue of women in science and the UK's work in this area. The fourth, less explicit, though important message was to inspire young women to consider a career in science, engineering and technology.

Supporting actions taken by our science team in London include building relationships and partnerships with other national stakeholders in order to assist in-country delivery, and setting the strategic direction for the global network. The annual expenditure by the British Council on science programmes worldwide is £9 million, with activity in around 70 countries, delivered by 250 staff. A previous major thematic project, ZeroCarbonCity, which looked at the global climate change debate, reached some 10 million people worldwide over a two year period.

Recognising the two distinct recipient communities, scientific and public, and the need to address both, we are building science communication in as a central part of our work and encouraging people to develop science communication skills and

create an 'open research' which is transparent and accountable to citizens.

This is, in part, behind the thinking of the expansion to a regional project, 'Beautiful Science', which is a highly successful exercise in helping young scientists in South East Europe to communicate with the public in novel and engaging ways. The successful partnership we have developed with the Cheltenham Science Festival and Visualise, who bring their very distinctive track records and strengths to Beautiful Science, is also an example of how we want to work in the future. We want to move to a position where such communication is an innate (and enjoyable) element of research work, rather than being seen as a distinct, separate area of activity.

The British Council's Royal Charter, states that the objects for which the Council is established include the encouragement of 'cultural, scientific, technological and other educational co-operation between Our United Kingdom and other countries'.

Our future effort will be concentrated on promoting symmetrical scientific and technological co-operation; building mutually-beneficial relationships with like-minded policymakers and organisations and working in partnership with them in order to provide products that will support the exchange of knowledge, ideas and information and the building of long-lasting contacts and collaborations. We will favour initiatives directed at mobile early-stage postdoctoral scientists in academia, research institutes and industry, recognising the relative paucity of mechanisms to help this younger section of the UK scientific community get established on the international scene, and we will work with the UK research councils to ensure their continued career progression.

Today this agenda is more relevant and important than ever if we are to show to other peoples our values and achievements as well as our vision of a safer, more harmonious world.

. . . A previous major thematic project, ZeroCarbonCity, which looked at the global climate change debate, reached some 10 million people worldwide over a two year period. . .

. . . we are building science communication in as a central part of our work . . .

NECESSITY SHOULD BE THE MOTHER OF INNOVATION

Professor Martin Binks

Dr Simon Mosey

Paul Kirkham

University of Nottingham
Institute for Enterprise and
Innovation (UNIEI)
Nottingham University Business
School

The imperative of thinking differently, identifying and exploring opportunities for innovation, may never be greater for many organisations than in a period of economic recession, yet the likelihood of it occurring in practice given the frequent need for short-term 'fire-fighting' may never be lower. At an economy-wide level, the same impasse and disjoint between what is required and what is likely to happen in practice jeopardises the process of renewal and recovery. There may not be an obvious solution to this conundrum but there are some straightforward possibilities that might be considered by

organisations small, medium and large, private or public.

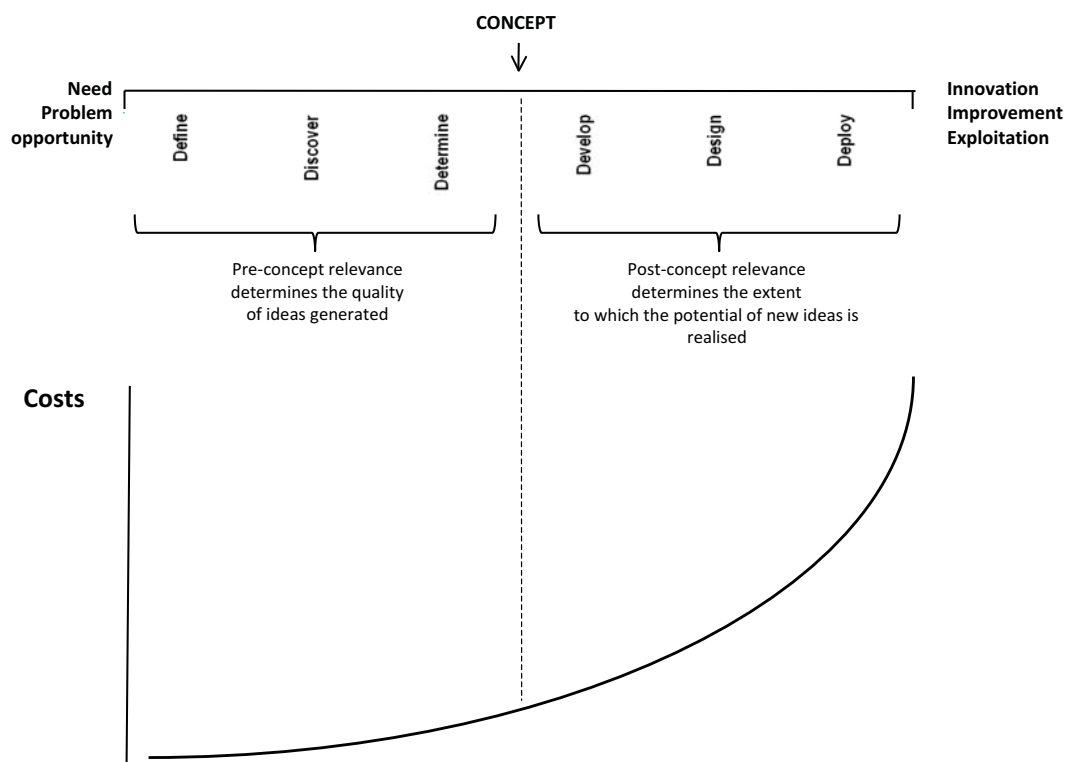
It has long been recognised that entrepreneurship and innovation underpin economic development and progress. Back in the early 20th century Joseph Schumpeter, the famous Austrian economist, emphasised the crucial distinction between incremental and discontinuous innovation. The first builds on gradual improvements to the accepted and established methods of operation whilst the second causes radical change. The first improves, the second transforms. Whilst Joseph Schumpeter was observing these characteristics in the generic context of economic

development precisely the same principles apply to individuals and also businesses and organisations of all kinds.

Incremental innovation may be important in maintaining or increasing market share often in response to market research and customer feedback. The inspiration for radical innovation that involves considering key aspects of a business from non-obvious, different and novel perspectives may reveal opportunities previously unrecognised. These innovations are not just restricted to products, services and processes but also refer to organisational behaviour, structure and culture. Whilst it may be important for

Successful innovation depends upon the quality of the concept. The Ingenuity Guide for Clear Thinking optimises the prospects of success by applying creative thinking at the heart of and throughout the innovation process.

The Process of Innovation →



organisations to refresh their 'offer' in order to remain competitive within existing markets and technologies it is also crucial that they undertake a more wide-ranging and free-thinking review of all areas of their operations to ensure that opportunities previously unrecognised are not missed. To achieve this requires rigorous 'pre-concept' preparations prior to 'post-concept' implementation strategies. Consider the continuum of innovation that stretches from problem or opportunity identification all the way through to a new innovation.

Given a problem, opportunity or perceived need then in a perfect rational world those considering implementing an effective response would follow a simple but rigorous procedure.

In the definition phase they would strip the problem down to its root causes and prioritise these so that they could be dealt with one at a time.

In the discovery phase the root cause concerned would be comprehensively explored with as rich a set of solutions as could be produced using divergent thinking and solution storming.

In the determine phase the wealth of spontaneous ideas and solutions would be sorted and sifted and reduced to a number of viable practical alternatives. Proven techniques would then be used to ascertain the best possible solution.

The new product, process, mode of organisation or structure that emerges from this pre-concept focus would then be subject to more familiar considerations in terms of development, design and eventual deployment.

In practice, as individuals or organisations, we tend to neglect this crucial 'pre-concept' focus and default immediately or very quickly to the nearest solution

emerging from previous experience or that deployed by others. When confronting a problem there is pressure to seek a solution as quickly as possible. This means that the rigours of definition, solution generation and solution selection are neglected and the flow of new ideas and concepts into organisations and economic progress more generally may be suboptimal. Pre-concept innovation analysis may also help to filter out unworkable concepts at an early stage when the sunk cost involved is quite low.

Insufficient focus on problem definition, idea generation and concept selection often allows significant costs to be incurred before fundamental weaknesses that could have been detected much earlier are fully recognised.

In order to determine the levels of innovation in a business it is important to consider the extent to which opportunity identification activities are present and pre-concept analyses are undertaken. The extent to which new products processes and organisational changes are introduced should also be considered. As indicated above time pressure may appear to preclude these considerations in practice particularly when 'fire-fighting' in a recession but finding some space to reflect on these issues in the context of prevailing business practice could make a significant positive difference.

Rapid decision making under pressure without allowing recourse to advice or reflection is sometimes mistaken for strong and effective leadership. Whilst those responsible for leadership may regard this approach as unavoidable in the circumstances it means that there is virtually no 'pre-concept' focus and the existing reservoir of experience and understanding latent in the rest of the organisation is ignored.

... Incremental innovation may be important in maintaining or increasing market share often in response to market research and customer feedback. . .

Creativity and the generation of innovative ideas are not the jurisdiction of a select few; they are open to everyone. We often tend to be self-limiting in the extent to which we share ideas for fear of humiliation, criticism or simply due to a lack of trust in how these may be used or recognised. Open innovation and the sharing of ideas requires structure and trust and may best be established through collaborative pre-concept working across the organisation. Approaches and systems that are created by those expected to apply them may be less susceptible to rejection and therefore more long lasting. Given the prevailing trading conditions in many markets, now may not seem to be the best time to stop, think and reflect but it may be just what is needed.

The 'Ingenuity Approach' developed over the past two years at the University of Nottingham Institute for Enterprise and Innovation (UNIEI) at Nottingham University Business School (NUBS) has been designed with the specific aim of 'demystifying' pre-concept innovation activities. It enables and encourages individuals and

teams to think differently, more creatively and more effectively. It leads to the generation of non obvious and often superior solutions. This approach has been applied successfully in practice with a wide variety of groups including high growth SMEs, large public and private organisations, academics, post graduate students and now, most recently, the mass application of the principles with over 800 first semester undergraduates. Future developments include an exploration of the ways to harness the creativity of hundreds of teams of bright young minds by encouraging them to apply the Ingenuity approach to pressing live problems affecting people, communities and businesses. The outcomes are impossible to predict but their impact could be enormous.

The Ingenuity approach is now available more widely from Amazon through the publication 'Ingenuity in Practice – A Guide for Clear Thinking' written by Paul Kirkham, Simon Mosey and Martin Binks.

ENVIRONMENTAL RISKS – HOW BEST TO ADAPT TO THE IMPACT OF GLOBAL WARMING?

Meeting of the Parliamentary and Scientific Committee on Tuesday 10th November 2009

ENVIRONMENTAL RISKS: HOW BEST TO ADAPT TO THE IMPACT OF GLOBAL WARMING



Lord Broers FREng FRS

The headline question is *"Environmental Risks - How best to adapt to the impact of global warming?"* Well, how much warming and on what time scale? Are we going to have to deal with an imminent disaster which requires dramatic action regardless of the economic and life style consequences? Are we in effect at war and life as we know it is going to have to be suspended while we solve the problem, or are we going to have time to adjust and pursue longer-term solutions? Lord Stern suggested that the latter is the case although lately he has indicated that his estimates may be optimistic. While people are working on this worldwide, I have not been able to find any validated data that helps resolve this issue.

Estimates of the degree and rapidity of warming vary hugely, which is understandable because they are based upon extrapolations made from temperature data where the signal to noise ratio is only about 2:1¹ and the temperature increase over the last 95 years has been a barely measurable 0.75°C. The retreat of glaciers and the reduction in Arctic ice

are indicators of warming and have been accelerating over the last two decades but as with the temperature data it is difficult to come up with accurate estimates of timescale. The question of whether the warming is man-made is even more uncertain but, to the extent that one can read through the noise in the temperature and ice data, there has been an anomalous increase recently that corresponds with the increase in manmade greenhouse gas production, so intuitively it would seem likely that manmade activity has given rise to the warming.

The evidence has been sufficient for the climate scientists to conclude that it will be all right if we limit the temperature increase to 2°C and take until 2050 to stabilise the situation. I will not discuss the uncertainties inherent in coming to these conclusions, but accept them so that I can answer the other questions.

So in answering the question *"Are we approaching climate change impacts in the right way?"* – I tentatively whisper "I

hope so" – I assume that the climate change impacts are those assumed in the UK Government's Low Carbon Transition Plan, and that we accept the G8 Leaders agreement that it will be sufficient for us to restrict global temperature rises to no more than 2°C.

We next find the statement that *"The Copenhagen Summit will arouse expectations"* which is followed by the question *"Should this process be subjected to further questions?"*

My answer to this is a firm "yes" and as the latest projections about the advances that are likely to be made at Copenhagen decline, my "yes" becomes even stronger. We are going to have to go on questioning whether we are approaching climate change impacts in the right way again and again over the next decades, while we strive to understand the situation better and can measure the effects of our actions and decide whether they are adequate. This is not an issue where we make a plan, implement it and then go on with business as usual.

Then comes a series of questions the first of which is *"Are there more cost-effective ways of achieving the targets?"* I assume this refers to the ways laid out in the UK report. The answer again is "yes", but many

... We are going to have to go on questioning whether we are approaching climate change impacts in the right way ...

of these ways will be difficult to realise because they rely on changes in behaviour. In the developed world we consume vastly more energy than we need. Many live in large houses generally heating or cooling the entire house while living in less than 20% of it and wearing clothes that bear no relation to the outside temperature. Many drive cars with engines large enough to propel a bus and drive in them when they could easily walk, cycle or take public transport. We consume food that requires more energy than is necessary, and on average consume twice as much of it as is good for us. In the world at large the most effective reduction in energy, food, and water consumption would be realised if we did a better job at controlling population, but stupidly it has become politically incorrect even to say this.

In any case there are innumerable ways to reduce energy consumption that cost nothing, or reduce cost, but it is not easy to persuade people to adopt them. This should become easier in the developed world when there is stronger local evidence that the warming is real. Over the last couple of years, for example, there has been little evidence of warming in the USA. The average temperature in 2008 returned to the 100 year average and this year is only slightly warmer, so the average citizen, especially in the Mid-West, is not convinced, nor even interested in the subject let alone in changing their life styles. Fortunately the President takes a longer view and US investment in climate science and mitigation is large.

Next is the question *"Instead of stress on unreliable renewable energy, are there technologies that will tackle the impact of climate change more effectively?"* Nuclear power is

the simple answer to filling the gap while we make renewables reliable or find new alternatives. Time is also needed to rebuild the grid so that it efficiently handles intermittency from renewables. Storing nuclear waste has been resolved, even in the UK, although we have wasted several years reinventing the wheel. The Canadians, Finns and French worked this out over five years ago. The time we will take to complete the first plant is several years longer than our competitor nations and most of the nuclear plants will be in locations where it will be difficult to use efficiently the 40% of the power that emerges as excess heat. This issue should be discussed with the public even if it is unlikely that people will opt for the benefits of energy saving and of low cost district heating if it means living closer to what they think – in error – is a high risk nuclear power plant.

"What happens if the targets are missed?" "What are the worst environmental risks?" The consequences may be serious – droughts, sea level rise inundating low lying communities, changing patterns of agriculture. If we assume the worst case the predictions are dire even if their timing and severity remain uncertain. They are made even worse by the fact that we are going to run out of gas and oil long before we run out of coal, and unless we find cleaner ways to use coal, its use is going to accelerate the warming. In the worst case, hundreds of millions, maybe billions of people will be forced to move to higher ground. The majority of the largest cities in the world are built on coasts, or next to rivers and consequently close to sea level, and will either be flooded, or massive dykes will have to be built to protect them. Others in the arid parts of the globe will have to move if they are not to die of starvation or thirst.

... In the world at large the most effective reduction in energy, food, and water consumption would be realised if we did a better job at controlling population, but stupidly it has become politically incorrect even to say this. . .

"What actions should be taken to avert or mitigate them?" The first priority is to improve our understanding of the phenomena that lead to climate change so that we can develop more accurate models that will allow us to decide what is feasible. At present we are drawing conclusions from incomplete information and there is little consensus about what is going to happen and hence about the seriousness of the situation. While we wait for this confirmation we have to be cautious and act immediately to reduce the production of carbon. How rapidly we can do this is an economic question, which inevitably becomes a political and social question.

"In this debt-laden world, will governments be in a position to afford to keep their pledges?" Probably not. *"Will the public decline to bear the cost?"* Probably "yes" – if they are given the option. They were not given the option to oppose the sums given to the banks on the basis that without them the world financial system would collapse, so perhaps they will not be given the option again as the consequences will be even more serious.

"Are other technologies going to be available in time?" The big hope is that fusion power will become feasible around the latter half of the century. Fusion power is the ideal solution because the fuel supply is in effect unlimited and there are

no byproducts that change the atmosphere or need to be stored. However, there is no certainty yet about important aspects of the technology nor about the timescale. For example, the material composition of the blanket that surrounds the fusion chamber and adsorbs the neutrons that produce the heat is yet to be decided upon, let alone have its lifetime assessed. It is also clearly not possible at this stage reliably to predict the cost of fusion energy. There is an intermediate technology combining fusion and fission that may be available on a shorter timescale and which is being pursued by the Chinese.

In the mean time, on a shorter time scale, many of the renewable technologies will become more reliable and lower cost and the distribution problems created by their intermittency resolved. Improved public transport systems and low emission cars should also become available. In addition there is the hope that it will be possible to use solar heat to provide a continuous source of renewable power on a very large scale. Strangely this option has only recently become widely recognised although it is possibly the simplest way to use the power from the sun, and to store the energy so that it is available continuously. One simply heats a fluid and pumps it under the ground into insulated reservoirs where it

remains until it is needed. Some say that sufficient electricity could be generated in the deserts of the Middle East and or Northern Africa to power Europe.

Let me finish by saying a few words about the UK. We have talked a lot about the dangers of climate change in the UK and the subject has been given higher profile by the media than it has in many countries, especially the USA. The BBC coverage has been extensive and its audience worldwide is therefore well informed. The Government published its UK Low Carbon Transition Plan in July of this year, and yesterday published the five volumes of Energy National Policy Statements. The Low Carbon Report explains in some detail the economic measures that are going to be used to provide incentives, such as renewable obligations, national and international credits, and contains descriptions of the various energy, transport and

agricultural alternatives.

Roadmaps are presented that lay out in general terms how emission cuts of 18% are going to be achieved by 2020. The National Policy Statement (NPS) for Energy sets out the Government's policy for delivery of major energy infrastructure and is accompanied by five specific NPSs that relate to the different energy technologies and to the distribution network. The NPSs are mainly do with the guidelines that the Infrastructure Planning Commission will use in making decisions about applications to build generating plants, and what is to be included in the applications.

Neither the Low Carbon Report nor the NPSs contain sufficient economic and engineering detail to assess the overall economic and technological credibility of the plan. The Government seems to be relying on the private sector to provide this and to be willing to fulfill their expectations, but

with the exception of mention of potential suppliers of nuclear plants there is little to back this up. This is disappointing as there is no reassurance that the mistakes of earlier strategies will not be repeated. Some of the past estimates, for example of the rate that off-shore wind could be implemented, turned out to be quite unrealistic. Such mistakes can be avoided if those with experience in delivering large scale energy and transport systems are consulted, but again there is no evidence in the report that such expertise has been sought.

Overall £405 million was committed to low carbon investment in April of this year but little of this seems to have been distributed, and one cannot help but notice that £405 million is less than 1% of the sum found to rescue the banks. The low carbon plan talks of the need to "focus on low carbon sectors where we have a competitive advantage such as wind, marine energy, civil

nuclear power, carbon capture and storage, renewable chemicals, low carbon construction and ultra-low carbon vehicles, and specialist financial and business services." An impressive list if only it were believable. On wind and nuclear, for example, we already seem to have lost the race not only worldwide but even within Europe.

I conclude with two recommendations. Firstly, that the Government talk more with those who will have to implement the low carbon plan and get their reassurance that it is feasible – that is to those with experience in large scale civil, electrical, nuclear, marine, transport, agricultural and geothermal engineering – and secondly, that we stop talking, conclude our plans, and get on with it!

1 See Chart 1 of the Government's Low Carbon Transition Plan http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

RESPONDING TO CLIMATE CHANGE: POLICY AND ECONOMICS



Paul Ekins
Professor of Energy and
Environment Policy
UCL Energy Institute,
University College London

THE QUESTIONS FOR DISCUSSION

Are there more cost-effective ways of achieving the Government's targets? Instead of placing stress on unreliable renewable energy, are there technologies that will tackle the impact of climate change more effectively? What happens if the targets are missed? What are the worst environmental risks? What actions should be taken to avert or mitigate them? Are other

technologies going to be available in time? In this debt-laden world, will governments be in a position to afford to keep their pledges? Will the public decline to bear the costs?

THE ENVIRONMENTAL RISKS

It is clear that societies need both to mitigate and to adapt to climate change, the question is how much of each? It is evident however that the greatest risk is

from runaway climate change. There are at least a dozen tipping points of different kinds involved. The costs and the risks of climate change are greatly increased if global average temperatures rise by much more than 2°C above pre-industrial levels and the current carbon trajectory seems set to deliver a 6°C increase. Hence the best approach seems to be to mitigate climate change by reducing greenhouse gas

emissions and, perhaps, large-scale engineering, as far as possible, and then adapt to what remains. I was very surprised to hear the DEFRA Chief Scientific Advisor saying recently that we should be prepared to adapt to 4°C as I doubt we would know how to do it in the light of some model predictions.

THE FRAMEWORK OF CLIMATE POLICY

Climate policy is a multi-level affair which needs to be coherent and consistent at all those levels. At the moment they are not, but it is possible they might become so and that is the importance of Copenhagen, in my view. We have not just the UN Framework Convention on Climate Change (UNFCCC). We also have the G20 which is a much more manageable body that has started to consider these issues. We have the European Union 20/20/20 by 2020 Programme, presenting a very well developed climate policy, which is the source of some of the targets we were asked to think about. We have our own Government's policy, most recently expressed in the Low Carbon Transition Plan with a raft of supporting documents including the Renewable Energy Strategy, and I noted in the questions we were set a slight note of scepticism concerning these renewables.

THE COPENHAGEN NEGOTIATIONS

I think that there are six criteria at Copenhagen that would set the stage for global GHG emission reduction and by which its success or otherwise may be judged:

1. Stiff binding targets for the industrial world, with the Kyoto signatories in particular, with targets set 20-40% below the 1990 levels.

2. Full US engagement and leadership, with legislation through Congress.
3. Commitments from the major developing countries, Brazil, Russia, India and China (BRICs), with energy intensity targets, to be converted into absolute targets in due course.
4. An extra gesture of commitment by China, and I predict that China will commit to a carbon tax on its exports prior to Copenhagen, just in order to diffuse the China Question that emerges at discussions of this kind ("What does it matter what the UK does? What about China?").
5. There will need to be a substantial financing package for developing countries in relation to mitigation/adaptation, with our Prime Minister deserving some credit, having put a number on the table of \$100B. It might not be the right number but we do need to start talking about numbers.
6. Finally, as Copenhagen will not be the last word, we do need a clear joint leadership commitment by the US and China to work through a deal, post-Copenhagen, to see that we *do* get an agreement in the subsequent 12 months.

We should recognise just how far we have come in the last 12 months in this area, when we had a US President who did not believe at all in Climate Change, and a Chinese President who said "It is none of

our business". The US President has changed and does believe in Climate Change and is now doing everything he can to see legislation goes through Congress before Copenhagen. The Chinese President has not changed but, but has certainly changed his tune. There have been very great movements on the international political stage that we should recognise.

THE G20

I am very encouraged by the G20, the new forum for discussing global issues for both Developed and Developing Countries, although much less coherent than the old G7 and the G8, but which is the body responsible collectively for 70% to 80% of world emissions. If it can agree on what to do about that, then with a unified presentation to the UN Framework Convention on Climate Change, we stand a much better chance of success. The importance of the US and China in that body will be impossible to overstate.

CLIMATE CHANGE MITIGATION: AN UNPRECEDENTED POLICY CHALLENGE

If we now turn to the Stern Report which was a landmark report, although what the report said that was new was very little. Much of it had been in the literature for quite a while, but it was the way Stern said it, the authority with which he said it as a economist, with great note and standing in other fields; that he was commissioned by the British Government to say what

he said, and who also put their full weight about publicising it, that caused it to have the global impact that it did. He identified three important strands of policy:

1. Carbon pricing: carbon taxes; emission trading
2. Technology policy: low-carbon energy sources; high-efficiency end-use appliances/buildings
3. Remove other barriers and promote behaviour change: take-up of new technologies and high-efficiency end-use options; low-energy (carbon) behaviours

The real problem, however, is to persuade other people to do things that they actually don't much want to do, and that is not easy in a democracy. Before we proceed to the national issues let us review the EU Climate Programme agreed in 2008.

THE EU CLIMATE 20/20/20 BY 2020 PROGRAMME

This comprises:

1. a 20% cut in carbon emissions (raised to 30% with international co-operation), with
2. a 20% content of renewable energy in final energy demand, and
3. a 20% reduction in energy use (below a hypothetical baseline), with targets rolled out to Member States.

For example: UK 15% renewable energy cuts by 2020;

16% cuts in GHG emissions from 2005 level from non-traded sector. Items 1 and 2 are enshrined in Directives from the EU and it is up to Member States to deliver. These are not options but statutory obligations we have signed up to. Failure to meet these could end up with the UK facing Proceedings in the European Court and potentially quite large fines.

The last fifteen years have been extraordinary years of policy innovation. We have had implemented practically every kind of policy that it is possible to imagine. Pricing Policies, Regulatory Policies, Voluntary Agreements, Labelling and Information Policies, across the board in a bewildering profusion. It has been a wonderful time to be a policy academic, because it is very hard to keep up with all the developments.

POLICY EFFECTIVENESS

However, the important question is how effective have

these policies been? The depressing fact is "Not very effective". Carbon emissions to which these policies have been directed have not gone down much since 1997 and the Government will still miss its 2010 target which it imposed upon itself and incorporated in two manifestos of reducing carbon emissions by 20% by 2010. Even though it would have had a 7% fall, which it did not seek, from the current recession. We will still not get to more than about 16%. So despite this proliferation of policies, they have not been applied stringently enough. Green fiscal reform is the subject of a major report from the Green Fiscal Commission, recently published and launched in Portcullis House by Adair Turner and three senior MPs. It talks about increasing the prices, especially of carbon and energy in order to meet the targets. As an economist, I must say that unless we increase prices dramatically we won't get

anywhere with carbon reduction. Hence political feasibility is certainly an issue here.

THE MACRO-ECONOMIC COSTS OF CLIMATE CHANGE MITIGATION

The costs and implications for economic growth are disputed by economists. There are the 'Optimists' who include Lord Stern and probably also myself. The 'Costs' are really investments and can contribute to GDP growth. There is considerable opportunity for zero-cost mitigation. There are a number of low-carbon technologies which are nearly available at relatively low incremental cost over the huge investments in the energy system that need to be made anyway, and which has been sweating assets for rather a long time. 'Learning curve' experience suggests that the costs of new technologies will fall dramatically. Climate change policies can spur innovation, new industries, exports and growth.

Unfortunately we are currently lagging behind the Germans in this important area. On the other hand 'Pessimists' consider that alternative energy sources are more expensive and are bound to constrain growth, while cheap, concentrated energy sources are fundamental to industrial development.

TECHNOLOGICAL POTENTIAL: THE SOCLOW WEDGES

I would like to summarise by ending with this famous diagram which addresses the issue of the technologies we might need, and indeed we might need all of them in order to maintain a stable pathway for future carbon emissions. (See www.scienceinparliament.org.uk).

IN DISCUSSION THE FOLLOWING POINTS WERE MADE

Non scientific arguments based on very selective study of the available data, which have been advanced by a very few sceptics and which attempt to dismiss the widely accepted evidence for climate change, are currently based on a study of very small scale variance over a very few selected individual years in relation to global trends measured over decades and ultimately over millions of years and preserved in the geological record. Indeed misinterpretation of data in this manner is clear to anyone with a basis in science but is deliberately used to create confusion among those who may lack the basic scientific knowledge to be able to assess the raw data for themselves. Variance in solar activity interacts with the effect of greenhouse gases to generate a resultant global warming trend which may therefore demonstrate short-term variance reflecting these parameters.

With specific regard to Copenhagen, is the Government sensible to agree and try and enforce a specific percentage reduction in carbon emissions, whether or not this is a realistic target, especially as the main risk arises from the exponential increase in the global population? Political parties in the UK have not disagreed about the realistic arguments for climate change. Hence it is anticipated that a future UK Government will be equally bound by existing agreements and commitments. Indeed the next Government will be bound by those targets but if unable to meet them may feel bound to repeal those targets thus generating political discussion. The purpose of models is to try to generate insights into processes. It is therefore important to consider 2050 as an important reference marker which is relatively soon when discussing the time required to deliver relevant

infrastructure. George Bush, who is not convinced by anthropogenic global warming, requested the US National Academy of Science to review the science, and not surprisingly, received a view reflecting that of his own and disagreeing with the IPCC. There is always a role for dogged scepticism in science. Regarding excessive global population growth, it is important to ensure that women who do not want large families have full access to the relevant information and contraceptive means to achieve this goal.

In politics new strategies have to be kept secret because you want to spring them on the other party and this leads to a lot of trouble because the very act of seeking advice results in leaking of information. Hence some scientists are often rather dogmatic in their views resulting in the generation of "antibodies" which react emotionally to a standard scientific model, leading to further hostility between parties to a discussion. We are particularly bad at dealing with complex large engineering-based infrastructure projects compounded by the lack of engineering advisers to complement existing science advisers. However this is not helped by Ministers signing up to deliverables knowing that by the time they are due they will be long gone! Many of the lifestyle changes required are essentially beneficial such as dietary changes from animal protein to vegetable protein, better public transport rather than private cars. However major projects such as the new Thames Barrier will depend on a much better understanding of the likely climatic impacts on projected sea level rise.

COME BACK GM: ALL IS FORGIVEN!



Professor Peter R Shewry
Rothamsted Research

BACKGROUND

The genetic engineering of plants is now a well-established technology, with the first genetically modified crop plants being developed in the 1980s and commercialised in the mid 1990s. In fact, in 2008 GM crops were grown in 25 countries worldwide, including Africa (Burkina Faso, Egypt), Asia (China, Philippines, India) as well as the Americas (North, South and Central) and Europe (Spain, Czech Republic, Romania, Portugal, Poland and Slovakia)¹. The total area covered in 2008 was 125 million hectares with four crops (soybean, maize, cotton and canola/oilseed rape) accounting for the majority of this¹. None of these countries have reported scientifically-substantiated problems associated with the crops and it is therefore difficult to understand why many in the UK remain so resistant to a technology which has proved to be safe and profitable.

ADVANTAGES OF GM TECHNOLOGY

Humankind has been manipulating crops for many years. For example, bread wheat first appeared about 9000 years ago and has been cultivated continuously since. Unconscious

selection over much of this period and scientific breeding over the past century have led to an immense range of diversity, with over 25,000 types of wheat now being represented in genebanks and germplasm collections.

Plant breeding has been highly successful in increasing crop yields and improving crop quality but also has significant limitations. Firstly, crops are immensely complex organisms. For example, the genome of bread wheat comprises about 50,000 genes. Plant breeding aims to identify the most advantageous combinations of these genes, by crossing selected lines, generating large populations of progeny and selecting these for the required combinations of characteristics ("cross the best with the best and select the best"). Consequently the production of new varieties of crop plants requires considerable investment of time (6-7 years in the case of wheat) and money as well as highly-skilled plant breeders. GM may therefore help to accelerate the production of new varieties, by precisely transferring single genes, or small numbers of genes, into current high performing backgrounds with no

detrimental genetic drag from the donor genome.

However, the major limitation to the production of new varieties by classical plant breeding is the level of variation in the crop, or in related species with which it can be crossed. Genetic engineering allows the exploitation of genes from other plant species, microbes or animals, including completely new genes with new functions. For example the herbicide tolerance and insect resistance genes which are widely exploited in commercial transgenic crops are derived from microbes.

FIRST GENERATION GM CROPS

The dominant trait exploited up to now has been herbicide tolerance, which accounted for 63% of the total area of GM crops in 2008. This is followed by insect resistance (15%) and the two traits combined (called gene stacking) (22%)¹. Other traits, including virus resistance, together have accounted for less than 1% of the total area.

Herbicide tolerance and insect resistance have resulted in massive improvements in yield and production efficiency. Furthermore, correct management practices result in substantial environmental benefits, particularly from the reduced use of insecticides on crops such as cotton.

Furthermore, in addition to being successful in their own right, these first generation traits

...correct management practices result in substantial environmental benefits, particularly from the reduced use of insecticides on crops such as cotton. . .

have been important in establishing the credibility of GM crops as components of global agricultural systems.

However, it is clear that the next generation of transgenic plants will be engineered to target a wider range of traits, including traits which are of fundamental importance for human nutrition and health in the 21st century as well as sustainable crop production.

WHY DO WE NEED GM CROPS NOW?

There has been much recent discussion of the “grand challenges” posed by population growth, climate change and the depletion of fossil fuels. The implication of these challenges for crop production is that yields on good agricultural land must be increased and cultivation also extended to land which is currently considered as unsuitable for crop production due to environmental constraints.

Of particular importance for future production is the development of staple crops that are able to resist drought, and this includes crops grown in the UK and Europe where drought is occurring with increasing frequency. Drought tolerance is likely to be achieved by a combination of classical breeding and genetic engineering, and drought-tolerant maize produced by genetic engineering has been



Transgenic plants of linseed engineered to produce fish oils in their seeds, being grown under containment at Rothamsted Research

This technology will have health benefits for human consumers and environmental benefits in reducing reliance on declining stocks of marine fish (figure kindly provided by Professor Johnathan Napier, Rothamsted Research).



promised by Monsanto and other companies. Similarly, resistance to high levels of salt or other minerals such as aluminium and boron will allow production to be extended to contaminated soils in many countries where climatic factors are otherwise suitable for crop production (including parts of Australia).

The second major limitation to crop yields, after climate conditions, is infection with pests and pathogens. The insect resistance genes deployed in the first generation of GM crops have proved to be very effective in combating insect pests but fungal pathogens remain a challenging target. The success achieved by BASF in engineering resistance to blight (*Phytophthora infestans*) in potato is therefore particularly impressive. GM also offers potential solutions to other

intransigent pest and pathogens including nematodes and molluscs where current control measures are very environmentally damaging.

A third consideration is environmental and economic sustainability. Current elite crop varieties have been selected to perform well under relatively high inputs of fertiliser, herbicides and pesticides which are becoming increasingly difficult to justify. GM could play a part in transferring traits such as nitrogen fixation, improved nitrogen utilisation and durable pest and disease resistance from unrelated species into crop varieties.

DIET AND HEALTH

In the UK, Western Europe and North America many health problems result not from inadequate nutrition but from over-consumption of highly refined energy-dense foods. These foods lack sufficient amounts of dietary fibre, vitamins and minerals and are often rich in saturated fats. GM offers opportunities to produce healthier foods with acceptable properties for consumers. For example, increasing the content of fibre and decreasing the digestibility of starch in cereal products will assist in reducing the incidence of obesity and

type 2 diabetes, which are projected to reach epidemic proportions by the middle of the present century. Similarly, omega-3 long chain polyunsaturated fatty acids (LC-PUFAs) (fish oils) have a range of health benefits but can currently only be sourced from oily fish. However, these compounds are not synthesised by the fish themselves but derived from marine microbes (algae and diatoms) in their diet. At present they are provided in diets for aquaculture by harvesting marine fish considered to be unsuitable for human consumption but this is not sustainable in the context of declining fish stocks. Recent work in public and private sector laboratories has led to the development of new types of commercial oilseeds which accumulate LC-PUFAs in seed oils, meaning that they can be used to replace marine fish in diets for aquaculture or consumed directly by humans.

Acknowledgements

Rothamsted Research receives grant-aided support from the Biotechnology and Biological Sciences Research Council (BBSRC) of the UK.

References

- 1 James, C. (2008) Global Status of Commercialized Biotech/GM Crops: ISAAA Brief No. 39. ISAAA: Ithaca, NY.

... Of particular importance for future production is the development of staple crops that are able to resist drought ...

COMEBACK GM: ALL IS FORGIVEN



Professor Howard J Atkinson
Centre for Plant Sciences,
University of Leeds.

Galileo Galilei stated that all “truths are easy to understand once they are discovered; the point is to discover them”. This view is central to scientific research on genetically engineered (GM) crops. This presentation attempts to cover the potential this approach has both for the UK and global food security and some of the constraints to progress. The core view advanced is that GM crops are not a panacea to achieve food security for all but an important approach that should be researched and not set aside. The context is the need for 70% more food from the current global agricultural area by 2050.

BENEFITS FOR THE UK

It is a commonly held view that the UK population can be fed without use of GM crops. This is essentially correct if food prices remain at current levels but any cost reduction GM crops can provide would benefit the estimated 30% of UK children that live in poverty. The deployment of GM crops offers a range of more certain advantages. These include improved productivity, reduced use of pesticides (PG Economics, 2003), the benefits that land sparing can provide (Green *et al*, 2005), an ability to

respond to climate change issues (eg increased water use efficiency), production of functional foods and of new products including medicinal products and vaccines at a fraction of current production costs (Fox, 2006; Nature Editorial, 2009).

Consumers support EU legislation moving in the direction of reduced pesticide application. It is generally accepted that plant resistance is the method of choice to control plant pests and diseases. A key advantage is that its use requires no change to agricultural practices. An example of much needed resistance in the UK is to one of two potato cyst nematodes, *Globodera pallida* which infests most of our potato fields (Atkinson *et al*, 2008). Over 50 years of conventional plant breeding has yet to provide a cultivar that is fully resistant to it. Resistance breeding for potato has the additional limitation that not all agronomically desirable traits can be delivered in one cultivar. This is shown by cultivars marketed in the last 20 years representing only 14% of the UK seed potato market. The GM approach allows improvement such as nematode resistance to be added to a cultivar without changing its other favoured attributes. Much research has established that this basis for nematode control poses no risk to the environment. It is safe for consumers because it relies on a protein already present in our food (eg rice and maize seeds). It is similar to a natural constituent of our saliva that we all swallow continually. Use of this technology offers the additional advantage of ensuring potato crops remain on the land

currently used for the crop. Movement of potato growing to other land has caused archaeological damage that concerns English Heritage.

FOOD SECURITY

The incorrect view that GM crops lack value for the poor has been exposed by the uptake of cotton with insect resistance in India. It was not introduced until 2002 but it was 81% of all cotton produced in India in 2008-9. Cotton production by that country has nearly doubled and yields have increased by over 80% (Karihaloo and Kumar, 2009). The lack of other successes in the developing world is in part the consequence of campaigns over many years against the approach. This has even forced potentially useful products from the market. As a result, innovation by public research and development of pro-poor applications has been suppressed. A strong case has been made that the EU as well as activists is responsible for much of this outcome (Paarlberg, 2008) although not all agree with that analysis (Scoones, 2008).

Plant biotechnology is now widely deployed (James, 2008) and applications should be developed for Africa (Karembu *et al*, 2009). There is a need for African nations to have the capacity to judge GM science and to adopt approaches that they consider have value for their people. Much of current effort on such crops is public not-for-profit research. This is preferable to technology being “parachuted-in” from developed economies. Cooking banana is an example crop that would benefit (Atkinson *et al*, 2003). Its sterility limits progress of conventional plant breeding but

enhances GM biosafety. Banana suffers severe yield losses from a range of pests and diseases that GM approaches could counter. GM approaches have particular potential when a plant and its cross-fertile relatives lack required traits. The potential of GM crops is enhanced when several beneficial traits are provided within one variety the poor wish to grow.

CONCERNS

Extensive experience of safe GM crops suggests those who seek to limit their uptake should provide the evidence to support their views. Their problem is that the weight of scientific evidence is contrary to the anti-GM standpoint. One often expressed concern is for the environment. Risk has been exaggerated and much made of flimsy evidence. One good example is the Monarch butterfly in USA. Preliminary concern was expressed that pollen of GM maize cast on Milkweed plants killed caterpillars of this butterfly that always feed on this weed, often at field margins. This concern can now be discounted (USDA, 2004). A second issue is the consequence of gene flow from a GM crop. This risk depends on the crop, its geographical location and also the ecological value of the GM trait to any recipient plant (Stewart *et al*, 2003). For instance, gene flow may occur from potato in Peru where nearly 200 wild relatives occur some of which grow in fields. In contrast there is no risk in the UK where limited wild relatives occur and crosses in the field have never been reported. Potato is therefore a safe crop for which to develop GM technology in a UK context.

Much is made by some of

the level of concern among the UK population over GM crops. However, neutrally framed surveys show this is a declining issue and not one of the top 10 food issues of the UK consumer (Food Standards Agency, 2008). UK consumers also support the use of GM crops in the developing world. GM crops must and can have a higher food safety than many currently consumed products. However, risk can only be assessed by considering both the hazards and any exposure to them. For instance, caffeine is the hazard in coffee and the exposure is the number of cups drunk. The reality is that the risk from drinking coffee although inconsequential is very much greater than for any GM crop that would be marketed.

CONSTRAINTS

Society needs whistleblowers and critics of any technology have a role to play. However continual use of inaccurate or flimsy evidence is not in the public interest but remains unchecked largely because there is no accountability. All our contributions to any debate are framed by other issues (Herring, 2009). A humanitarian perspective has led the Vatican to support consistently GM crops as a means to enhance food security (Anon, 2009). The

Nobel Laureate Norman Borlaug took a pro-science standpoint when judging them to be a second generation of the green revolution he founded. The contributions of those hostile to GM crops are also framed by other issues. Examples are the need for some non-governmental organisations to retain the high public attention level they need to generate subscriptions and a belief in other food production systems such as organic farming (Randall, 2008).

Legislation in the EU does not favour development of plant biotechnology (Atkinson, 2008). In particular it fails to recognise specifically the need for small scale field trials not tied to commercial intent. This need is accepted by the Canadian authorities (Canadian Food Inspection Agency, 2008). This is a key factor in the huge disparity between the number of GM field trials in USA (>1000 in USA in 2007 alone plus many small trials) and a total of only 496 in the EU in the period 2002-08. The EU has also failed to authorise the commercial growing of a starch potato after it passed through all its regulatory steps (German Federal Ministry, 2008). Instead of the EU supporting European technology and a knowledge economy, it has been taken to

court by a major European company (BASF, 2008) for its obstructive approach.

The overuse of the precautionary principle by the EU is also evident within the Convention on Biological Diversity that controls the Cartagena Protocol (Anon, 2000; 2009). Compliance with this protocol imposes a high cost for developing world nations (De Greef, 2004) but the real risks avoided have yet to be defined. It has also not used the protocol's article 7.4 for GM products with a long history of safe use to which the precautionary approach should no longer apply. Its biosafety committee also lacks an appropriate balance of stakeholder nations and seems unable to grasp the consequences of its negative stance. Doing nothing to enhance food security is a risk to the poor (Nuffield Bioethics committee, 2004). It delays and even blocks biotechnology that may have long term benefits (Strauss *et al*, 2009). The Convention on Biological Diversity has also proven ineffective against clear and present environmental risks in the UK. One example is the alien invasive species, the Harlequin beetle. It was previously used elsewhere in the EU as a biological control

agent and is now harming UK biodiversity.

Unfortunately, the UK has sometimes been slow to respond to technical advances. Examples are restrictions placed on the early motor vehicles (Anon, 2007) and milk pasteurisation. An estimated 40,000 UK citizens died of tuberculosis from 1908 until the 1930s while vested interests supported by some MPs resisted the adoption of milk pasteurisation (Phillips and French, 1999). Part of the opponents' arguments centred on considering the treatment of milk as an unnatural process. Modern parliamentarians should consider scientific evidence, identify misinformation and dismiss it. The UK needs politicians who come down firmly on the side of rightness and not expediency. They should use their influence to support the reform of EU regulation of GM trials and crops. The UK must develop a knowledge economy and use its crop science base effectively (Baulcombe *et al*, 2009). We should progress GM crops on a case-by-case basis with rigorous but not obstructive oversight on all aspects of food and environmental safety.

N.B. All text references may be obtained on the website www.scienceinparliament.org.uk

DURING DISCUSSION THE FOLLOWING POINTS WERE MADE

There is a big debate in the EU concerning this topic. One of the problems is that although the initiatives of Rothamsted and others working in this area are greatly appreciated, we also have learn as scientists to explain better, with openness, accountability, transparency and dialogue. If we look at Europe we have a massive problem there where many of the policy-making processes are considered only on a hazard-based rather than on a risk-based approach, which ignores the fact that a hazard without a target or a pathway is no risk. EU policy is strongly influenced by NGO campaign-based organisations comprising groups of activists. Hence the EU has become very risk-averse and clearly does not understand the difference between hazard and risk. The UK Government however works well on a science-based policy. Scientists are unfortunately losing the debate in the media where they need to deal with a lack of understanding of risk. Generic debates on technology are misplaced and should move on to consider specific issues, as in any other modern technology.

Greenpeace and Friends of the Earth have developed religious objections which ignore the scientific evidence and are unreliable witnesses, and when Peter Melchett was asked whether there is any evidence which would change his mind and change his opposition to GM, he responded: no, his views were definite, permanent and absolute. Opposition to GM varieties of maize, corn, rapeseed and soyabean has had a perverse effect resulting in these crops going into biofuels and bioethanol rather than being used to feed hungry people in the third world. GM is also banned in several countries as sensitivity to a pathogen could wipe out a whole crop.

The UK scientific community urgently requires scientific data on which to base future research, and although a case against trials is required to focus the debate, none has ever been provided in spite of every encouragement to do so.

SEVENTIETH ANNIVERSARY LUNCHEON OF THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE

A Lunch to celebrate the 70th Anniversary of the Parliamentary and Scientific Committee was held on Thursday, 15th October 2009 in the Cholmondeley Room and Terrace, House of Lords.

The President, The Rt Hon Lord Jenkin of Roding, opened proceedings with a warm welcome to all present.

"This is our second Lunch in the House of Lords this year. Last time we faced difficulties



Rt Hon Lord Jenkin, Professor John Beddington and Ian Taylor MP



Professor John Beddington and Lord May of Oxford



Sir Michael Spicer MP



Rt Hon Lord Morris of Manchester and Arthur Butler



Professor Peter Simpson and Lord Soulsby of Swaffham Prior



Dr Richard Worswick and Dr Tom Inch



Dr Dougal Goodman and Professor Michael Elves

due to the heavy snowfall, but managed an excellent lunch. We meet again to celebrate the 70th Anniversary of our founding towards the end of 1939. We were the first All-Party Parliamentary Group in what is now a very long list of APPGs which represent – among other things, virtually every country on the planet and virtually every organ of the human body! We were born out of extreme adversity at a time when the survival of the nation was in peril. A small group of MPs, Peers and representatives of scientific and technological organisations, led by Lieut Commander Christopher Powell RN, the founding Administrative Secretary, realised the urgent and compelling need for an effective forum for discussion of strategic scientific issues between Parliamentarians and leading scientists.

Although unofficial and enjoying no financial assistance from Government, its membership has, over the 70 years, included large numbers of MPs, Peers and leading figures in science and industry. It has been described by Prime Ministers as a 'unique British Institution'. Our history has recently been summarised in a splendid article in the latest issue of *Science in Parliament* – I am most grateful to Brian Iddon for editing this publication.

Sadly, some of our longest serving members cannot be with us today – including David Price, Roy Mason, John Osborn and Dr Alan Whitehouse. However, many others are here, and I especially welcome Arthur Butler, Christopher Powell's successor. No list could possibly ignore Annabel Lloyd who has guided us so wisely for almost 20 years!

Recognition of the crucial importance of science and scientists to the war effort was

highlighted by Winston Churchill's comment that Alan Turing made the single biggest contribution to Allied Victory in the war against Nazi Germany. There were many others such as Tizard, and Watson-Watt, for example, who led the development of RADAR, which made vital contributions to victory at the Battle of Britain. It is interesting to note that Watson-Watt ran the laboratory he established with 50 physicists to develop RADAR rather like an Oxford or Cambridge College, so that creativity was not shackled by red tape (Sir Alan Langlands and HEFCE please note!). Seventy years on and once more the UK is emerging from one of the gravest commercial and economic setbacks we have experienced since the war. Investment in science and engineering is recognised by many as the best way forward. However, there are many other countries to the south of us, comprising a billion people in Sub-Saharan Africa, where recovery will be much slower, if at all, due to hunger, malnutrition, poverty, water shortage and disease, combined with some of the highest population growth rates on the planet.

The UK's science and engineering base has had long-standing experience of working in these countries and contributing to their welfare ever since the time of Livingstone. The Committee covered Food Security last year in an interesting discussion. Once more, the way forward is hopefully being re-opened to leading UK-based scientists and engineers to help tackle this increasing problem of global dimension.

It is with the greatest pleasure that I now introduce our guest speaker, Professor John Beddington FRS, who has

reminded us of Thackeray's *Vanity Fair* and a 'perfect storm' of problems arising by 2030. Professor Beddington was appointed as Government Chief Scientific Adviser on 1 January 2008. John's main research interests are the application of biological and economic analysis to problems of Natural Resource Management including fisheries, pest control, wildlife management and the control of disease. He started his academic career at the University of York and spent three years on secondment from York as a Senior Fellow with the International Institute of Environment and Development. He has been at Imperial College since 1984 where he headed the main departments dealing with environmental science and technology. He was Professor of Applied Population Biology at Imperial until his appointment as GCSA. In 2001 he became a Fellow of the Royal Society and was awarded the Companion of the Order of St Michael and St George by the Queen in 2004. John – It's over to you!"

John Beddington announced that discussion of Copenhagen was "off the agenda" on this occasion by special request of the Chairman, but responded with two quotations from Hilaire Belloc. In his poem *The Modern Traveller* he alludes to a certain Blood:

*'Blood thought he knew the native mind;
He said you must be firm, but kind.
A mutiny resulted.'*

Moving on in the poem Blood continues:

*'He stood upon a little mound
Cast his lethargic eyes around,
And said beneath his breath:
"Whatever happens, we have got
The Maxim Gun, and they have not".'*

John indicated that he would like to propose that the Maxim Gun effect in Belloc acts as a metaphor for science in the UK where we build on our excellence in science and engineering to make us a competitive and prosperous nation. For example, Lord Sainsbury's Review of Science and Innovation in October 2007 emphasised that we have "an extraordinary record of scientific discovery." We are the world's most productive research nation with 12% of world citations, 9% of world research publications, 5% of world research spending, 1% of world population and funding is key to maintaining this excellence. The acceptance of science, and, he emphasised, engineering, are clearly both important. The Prime Minister has confirmed his commitment to the science ring fence and his commitment to science. At the Romanes Lecture, Oxford, 2 March 2009, he said "when it comes to all the challenges of creating a truly global society – it is science alone that can give us hope."

Professor Beddington continued: "These sentiments are being echoed across the pond where President Barack Obama (elect at the time) in his Science Team Rollout Radio Address, on Friday, December 17, 2008 in Chicago, Illinois stated, 'Science holds the key to our survival as a planet and our security and prosperity as a nation. It is time we once again put science at the top of our agenda.' Obama has since backed this with the following key appointments:

John Holdren Assistant to President and co chair of PCAST (President's Council of Advisors on Science and Technology);

Harold Varmus, Nobel Laureate – senior science advisor;

Eric Lander, mapping the human

genome – senior science advisor;

Jane Lubchenco, head of the National Oceanic and Atmospheric Administration (NOAA) and member of the Royal Society;

Stephen Chu, Nobel Prize-winning physicist – Secretary of Energy.

Barosso has also announced the appointment of the new European Chief Scientific Advisor in a speech, *Strengthening Europe in a Time of Change* at the European Parliament in Strasbourg, on 15th September. This emphasises our need to work internationally and collaboratively. In the UK there is the existing network of CSAs, the Research Councils and Learned Societies and Lord Drayson. The RCs are helping with cross-council programmes and also building links with industry through the TSB and ETI.

Key areas where the Government should focus are as follows:

1. Low Carbon Energy

A table from the International Energy Agency IEA technical perspective report shows what we will need to do every year between 2010 and 2050 globally to meet the challenge, for example, to build 35 coal fired CCS plants every year for 40 years:

Technology	Annual Deployment Rate
Coal with CCS	35 plants (500MW)
Gas with CCS	20 plants (500MW)
Nuclear plants	32 plants (1000MW)
Hydro-power	1/5 Canada's hydropower capacity
Biomass plants	100 plants (50MW)
Wind onshore	14000 turbines (4MW)
Wind offshore	3750 turbines (4MW)
Geothermal	130 geothermal units (100MW)
Solar PV	215million M2 solar panels
Solar CSP	80 CSP plants (250MW)

The Nuclear Industry Association has welcomed the Government's establishment of the Nuclear Centre of Excellence. The centre will be a major boost to the promotion of proliferation-resistant safe nuclear power around the world as well as helping to lead research to further reduce the environmental impact of the technology.

2. Infrastructure

The Council for Science and Technology report *A national infrastructure for the 21st Century* recently presented the following key findings:

'The Government needs to appoint an advisory body to help it deliver a clear and consistent vision for the future of the National Infrastructure; the Government also needs to decide which department should take overall lead for the National Infrastructure and the lead department, the Cabinet Office and the new advisory body should set out a vision for the National Infrastructure by 2010.'

3. Communicable and non-communicable diseases

Lessons have been learned from swine flu: scientists on the Scientific Advisory Group for Emergencies committee (SAGE) believe that all possible steps are being taken. A senior adviser has said: 'The UK is doing extremely well.' However,

increases in population and urbanisation may help diseases spread further, wider and quicker. Also increased genetic changes to existing viruses and the emergence of new viruses are more likely. The current swine flu outbreak has highlighted the relative unpredictability, speed and global nature of the spread, but, we have been fortunate (so far) as it is relatively 'mild' and susceptible to antiviral drugs, such as Tamiflu and Relenza. We might not be so lucky in the future as other pandemic influenza viruses could be more transmissible and more severe such as H1N1 mutation or our great worry, the H1N1/H5N1 re-assortment. There is also no guarantee that drugs or vaccines can be developed in time to mitigate the effects of such novel viruses and strains.

Influenza viruses are not the only ones that we have to deal with. For example, there are many others, such as. HIV/AIDS, hepatitis, Dengue fever, Lassa fever and yellow fever. This covers the treatment agenda, but we must not forget the prevention agenda where obesity is one of the biggest health challenges we face.

Almost one in four adults in England are currently obese, and if we carry on as we are by 2050, nine in ten adults will be overweight or obese. The cost of overweight and obese individuals to the NHS is estimated to be £4.2 billion and is forecast to be more than double that by 2050. Of particular concern is the prevalence of obesity among 2–10-year-olds, which is around 15%, with other data sets suggesting this could be worse! We also need to address increasing rates of diabetes, heart disease and cancer.

4. We ignore demography at our peril.

We have an increasing, but also ageing, population to deal with, not just in the UK but globally. The working age population however will decline proportionately, as follows, with figures presented as a percentage year on year. Europe from 2011, declining by 0.5%. (2047 declining by 1.0%). China from 2028, declining by ~0.5%. Russia from 2014, declining by 1.0%. (2049 declining by 1.5%). South Africa will increase (around +0.5% until 2042). We will need to anticipate how this will impact on the healthcare system and on the working population and with increasing population overall, this will increase demands for food energy and water."

In summary, John emphasised that by applying the Maxim Gun metaphor where we started, we must continue to maintain and build on our excellence in science and engineering, to make us a competitive and prosperous nation. Funding is the key to maintaining this excellence, not just in Government, but in industry also. We need to recognise the crucial importance and acceptance of both science and engineering and as Stephen Chu said 'people are entitled to their own opinions, but they are not entitled to their own facts!'

Ian Taylor, the Chairman, responded with a vote of thanks and congratulated John Beddington on presenting such a broad understanding of important issues for engineers and scientists to consider in what is an extremely important job without any need to mention Copenhagen on this occasion!



THE DEEP

Colin Brown

Chief Executive, The Deep

The Deep in Hull is a registered charity with trustees drawn from industry, commerce, local government and academia. To many it is little more than a nice day out, an aquarium of a quality and rigour which is rarely seen in those whose sole driver is profit. Opened in 2002 and constructed around a 2.8 million litre central tank, its unique architecture, storyline and blend of interactivity with stunning film and real animals made it something of an overnight success with almost 4 million people visiting since opening. In its first 12 months it generated over £50m of positive publicity, which established The Deep in people's minds as a major tourist attraction.

However this image is far from the whole story, like a shark's fin some of our most exciting work lies below the surface!

Hull has always had a special relationship with the sea. Home to The Bounty, port of exit to both Robinson Crusoe and Bram Stoker's Vampire Hunters. Salt water flows past the city's gates and into the hearts of its people.

Once the greatest whaling port on earth, then the largest deep sea fishing port, Hull has always made its living and taken much of its unique culture from the oceans.

Over the years whole industries have developed on the back of this relationship, chemicals, pharmaceuticals, logistics, food processing even caravan production using the same skills that once serviced the great fishing fleets of the Northern Trawl.

Whilst many of these spin-off industries still survive, the fishing industry itself largely disappeared after the Cod War leaving Hull to turn both physically and culturally away from the sea.

The task we set ourselves then for Hull's Millennium project was therefore nothing if not ambitious. It was and is to trigger a new relationship between Hull and the Oceans. It was to be a sustainable relationship based on science and education it was perhaps most ambitiously of all to transform Hull into a genuine short break tourism destination and a centre for environmental research. So to what extent have we succeeded?

Well, as an educational and environmental charity The Deep now runs a largely, but not exclusively, primary schools educational programme which this year will welcome over 30,000 students to our formal educational programme. For those who cannot make the journey we have established a video conferencing service where we take the sights and sounds of one of Europe's largest aquarium tanks right into the class room for an interactive conversation between our trained guiding staff and the child.

We have campaigned against shark finning and the keeping of inappropriate fish by hobbyists. We have developed breeding



Photo: Richard Bryant ARCAID

programmes for rays, jellyfish and other species. But more recently it is the success of our in-situ research work which has really begun to show a way of delivering on that original aim to re-invent Hull's relationship with the sea in a new and sustainable way.

Firstly, The Deep houses the University of Hull's Total Environment Simulator (TES) – a key partner from the outset the Universities Total Environment Simulator can model river and estuarine environments in real time. A participant in the Hydralab III network, the TES is part of the 6th EC framework programme and has

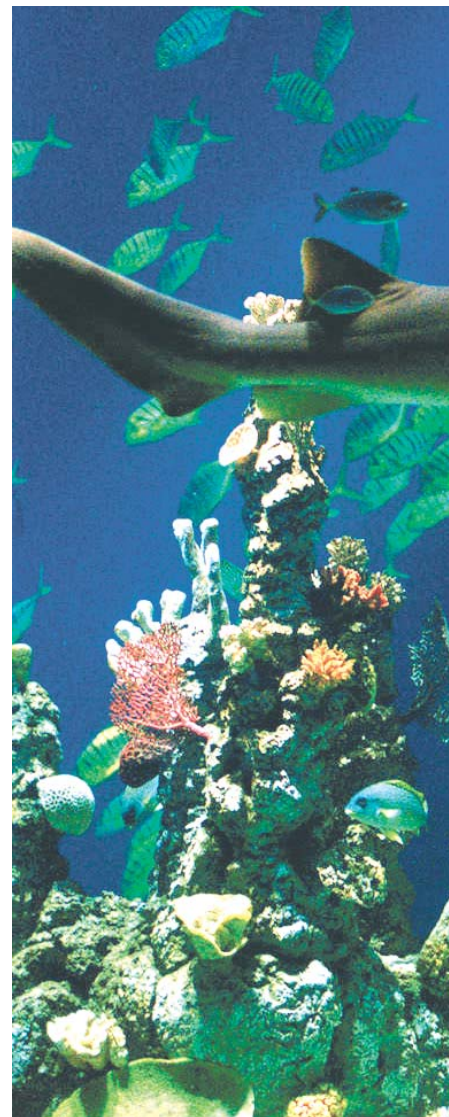


Photo: Kelly Timmins

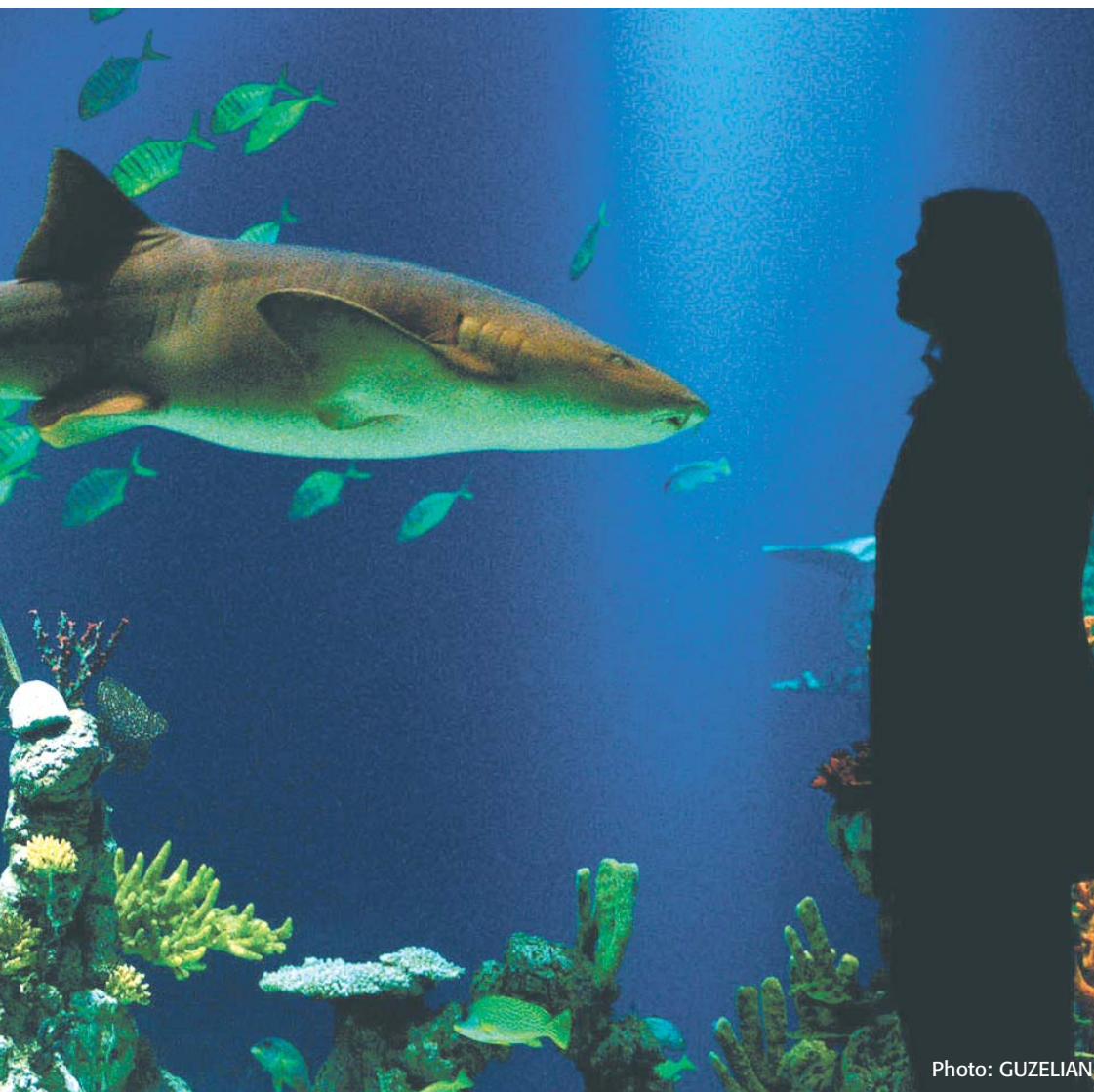


Photo: GUZELIAN

conservation project to protect the Giant Manta Rays of the Sudanese coast.

Closer to home we have spent some years now campaigning for a Marine Bill, and were therefore delighted with the recent legislation to establish a network of marine protected areas around our coast.

However, be careful what you wish for, as Natural England then approached us to chair the Project Board for "Netgain" the project charged with delivering such a network from the Scottish Borders almost to the Thames Estuary. Our role is to act as an honest broker and to establish the mechanisms and management structures necessary to achieve a genuine consultative process involving the many and varied groups who have an interest in our coastal waters.

Whilst we are well aware of the difficulties that lie ahead for Netgain, the prize will be well worth the pain – a network of scientifically legitimate marine protected zones which carry widespread public support, and of course ultimately a sustainable North Sea.

Whilst our education work is invaluable, it is our involvement in research, conservation and science that has transformed us from fun day out into a contributor to national policy and it is Netgain that could one day deliver our dream of establishing a new and sustainable relationship between Hull and the sea.

Perhaps, one day, even of re-establishing a fishing industry in Hull?

For further information about The Deep, visit www.thedeep.co.uk

been used to provide data on a number of projects, one of the earliest being to develop a more efficient tidal flow electricity generator, the first working prototype of which is now about to be installed next to our site in the Humber and which will provide us with a totally renewable and reliable source of power.

Again our links with the University have led to a number of collaborative partnerships including work establishing a sustainable sea-cucumber fishery in the Red Sea, a project which quickly became an urgent conservation project once the full extent of the threat to the fishery became clear.



Photo: GUZELIAN

We are also involved in SECORE (SExual CORal Reproduction) a multi-national project which aims to collect and grow on coral species in captivity and to build up a genetic bank as a resource against the ravages of ocean acidification and coral bleaching.

We have assisted on studies on the Great White Sharks of South Africa and the Great Barrier Reef in Australia. Recently we have been honoured to be a partner with the Equipe Cousteau Foundation and have agreed to commit both funds and personnel to a major

EMERGING TECHNOLOGIES - EMERGING MARKETS

IMPLICATIONS FOR THE FURTHER EDUCATION SECTOR IN RESPONSE TO EMERGENT SKILLS NEEDS.

Dr Philippa Bell.

Director of Policy and Research, New Engineering Foundation

Problems with staff training, new course development and student enrolment are seriously damaging the Further Education (FE) sector's ability to rise to the challenges and opportunities presented by scientific innovation. This in turn harms industry as a whole.

These are among the findings of a report *"Emerging Technologies, Emerging Markets"*, published by the New Engineering Foundation (NEF).

Introduction

The development and application of new and emerging technologies is vital to the expansion of existing markets and indeed the opening of new market opportunities.

Ensuring that these market sectors have the skilled workforce required to exploit such technologies is vital.

The FE system has the potential to play a significant role

in supporting the commercialisation and market development of new technologies, alongside developing the intermediate and higher level skills required by industry operating in sectors that are dependent on the application of those technologies.

The NEF has explored the extent to which FE colleges are delivering courses in emerging technologies and pinpointed the factors which enable and inhibit the FE systems state of readiness and development.

The current state of play in the further education sector

A case study based approach was adopted, in order to illuminate how industry and the FE sector are working together, to meet its needs in relation to the exploitation of emerging technologies.

The picture that emerged is described below, alongside an articulation of some of the barriers to the FE sector's engagement with emerging technologies.

Review of technological developments

Horizon-scanning techniques have yet to be used extensively in the FE sector. Thus colleges do not systematically review technological or indeed sectoral developments. Such developments include the rationalisation and decline of existing sectors and the emergence of new sectors like renewables.

Market intelligence

A college's ability to horizon-scan effectively is limited by its ability to use and prioritise available market intelligence.

In addition, this market intelligence and the ability to horizon-scan is further complicated by the speed of technical advances and economic factors. These include changes in employment conditions, Gross National Product, and prices (inflation, deflation).

Design and delivery of programmes

There is a high risk associated with the design and delivery of programmes in emerging technologies, particularly as initial financial investment can be high and the current funding model requires financial return to be projected over time against expected student numbers.

Working with employers is therefore critical to ensure that there is continuity of demand in order to mitigate the risk for colleges. This is particularly the case in niche markets.

Pockets of excellence

The integration of emerging technologies into the curriculum offer of colleges has largely been by way of enhancement activities.

Consequently there are pockets of excellence across the FE sector but these tend to form only a small element of existing programmes. The exception can

be found, but only where there has been close industry involvement in the specification of the curriculum and commitment from industry to a sustainable flow of learners.

Staff expertise

Colleges do not have staff with the appropriate experience or expertise to deliver in emerging technology specialisms. Hence they lack sufficient capacity and capability to design and deliver programmes in new areas and are reliant on a handful of 'opportunistic and enthusiastic individuals' to drive cutting edge programmes.

As a result of this situation, colleges are deploying a range of approaches to strengthen their capacity and capability and are increasingly reliant on bringing in external expertise from industry or universities.

Facilities and resources

Investment in facilities and resources to support emerging technologies is expensive and can limit access to existing courses and capability to open up new curriculum provision.

Nevertheless, by working together, colleges have been able to minimise their capital investment and improve efficiencies through sharing facilities and resources, as well as staff expertise.

Conclusions

The key messages in examining what practical steps are needed to ensure a better

alignment of the FE 'offer' to skills priorities, include:

Advocacy and leadership is needed at a national level to change deep-rooted perceptions of STEM related sectors and disciplines.

Funding and funding methodologies need to be revised, particularly in respect to encouraging colleges to be more flexible, respond quicker and have the capability to horizon scan.

Strengthening the links between industry, Higher Education Institutes and the FE

sector is vital if better alignment is going to be achieved.

Response times to emerging market/technology must be improved – the 'time lag' is too great. This will require different and more flexible models of course development and delivery, as well as quality assurance.

FE colleges need to be able to access effective market intelligence, particularly at a regional level. This is a prerequisite if strategic and curriculum planning decisions are to be evidence based and the risks of investment reduced.

Recommendations

The planning, commissioning and funding of provision in the FE sector is an area of concern.

The current model inhibits long-term strategy and planning in colleges and does not readily enable colleges to be responsive to new and emergent skills needs.

The development of new technologies and the emergence of new market sectors offer a unique opportunity for the FE sector.

However, the key requirement in order to improve

the capacity for the FE system to respond quickly to the development of new markets is a streamlining of the processes involved in course approval and/or a rationalisation of the number of awarding bodies and bodies such as the SSCs, that influence the curriculum.

A full report can be found at www.neweng.org.uk/emtech

You can follow NEFs activities to support FE in STEM on Twitter at <http://twitter.com/NewEngineering>

THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE VISIT TO THE DARWIN CENTRE, NATURAL HISTORY MUSEUM

WEDNESDAY 25 NOVEMBER 2009, 9.00 AM – 12.00 PM

Dr Michael Dixon personally welcomed the P&SC to the Natural History Museum's latest addition: the Darwin Centre. "We opened the Darwin Centre in September and I am delighted to say that it has been incredibly popular with our visitors. We are on course to reach 4 million visitors for the first time ever this financial year. The Darwin Centre is the most significant development that we have undertaken since the Museum moved to South Kensington in 1881. It is also a bold statement about our ambition for this organisation and a demonstration of our ability to take on and deliver large, complex projects. The Centre reveals, for the first time, the hidden scientific life of the Museum to our visitors, where they can interact with our scientists and together share the excitement of exploring, studying

and preserving the world around us. For over 125 years on this site our scientists have been generating knowledge about the natural world and using it to answer some of life's biggest questions, such as where we came from and how we can protect the future of our planet. Our ever-growing collection of over 70 million specimens represents a model of the world's diversity as it has developed over hundreds of millions of years. It is an important international research resource for those interested in the natural world. Over 350 museum scientists and 8,000 visiting researchers use these collections each year for projects such as barcoding the DNA of mosquitoes to help in the fight to eradicate malaria or helping the police solve crimes through our knowledge of forensic entomology.

Our expertise in taxonomy and systematics underpins all

life sciences and is a vital part of the nation's science capability. Yet until now all this has been going on behind the scenes and our visitors have had little idea how relevant this work is to their lives, and to our planet. The experiences provided by the Darwin Centre – and the Natural History Museum as a whole – will start to highlight the vital importance of understanding nature, our planet and its impact on all our lives, personally, locally and globally. There is currently nowhere else in the world where the public can engage with the science of nature on this scale and we hope that the Darwin Centre will change perceptions of what museums of natural history can be. The Darwin Centre is also an example of how we use public funds to leverage support from the private sector. We believe that it is essential for the economy for Government to continue to fund pure sciences,

like taxonomy and systematics for the benefit of applied sciences, and society as a whole.

We hope you enjoy your visit this morning. First, we are going to give you the opportunity to visit the Attenborough Studio, named after Sir David Attenborough, to watch a film inspired by his work. Then, you will be able to explore the interactive Climate Change Wall, located outside the Studio. Then, we are offering you tours of the Cocoon, so you can see into our collections and laboratories yourselves. Some of our scientists and visitor services staff will be on hand to answer any questions. Then finally, we have provided you with complimentary tickets to view Veolia Environment Wildlife Photographer of the Year. The Museum is open to the public from 10am, but until then you are free to enjoy and be inspired!"



Comments from some of the twenty-seven Members who attended the visit are recorded here.

Gail Cardew, The Royal Institution

For me, the most enjoyable part of the visit was watching the short video clips of the scientists on their field trips. These gave a real insight into what it would be like to experience the highs and lows of research – including the disheartening frustration of waiting for the rain to stop before sample collection could begin, alongside the sheer delight of beating a new path in the wilderness and



knowing that no person had been there before.

Sir Colin Berry, Queen Mary, University of London

I thought the Cocoon was a compelling exhibit and that the concept of allowing visitors to see working laboratories on the way down the sloping ramps was a good one. Each visitor is given a card with a bar code on which he or she can record items of interest to look at later on the museum web site using an individual number as an entry code.

Lindsey Bagley, Institute of Food Science and Technology

Darwin's theory of evolution is elegant simplicity, belying the complexity that, 150 years on, we are still unravelling. Climatically controlled, the public have access to two floors of the building to share in the nature and relevance of this collection of 20 million insect and plant specimens stored in three kilometres of cabinets. This is the largest collection in the world illustrating the planet's biodiversity of plants and insects.

Reg Sell, Life Member, Ergonomics Society

I was particularly interested to see that the museum covered all aspects of the natural history of insects from issues of taxonomy to the practical applications of their work, such as the combating of malaria.

Sheila Crispin, Royal College of Veterinary Surgeons

The Natural History Museum houses over 70 million specimens, so it is clear that more than one visit to this splendid building is needed in order to fully appreciate such a superb collection. In view of my own interests and the fact that the United Nations has declared 2010 the International Year of Biodiversity it seemed entirely appropriate to concentrate on finding out more about the global aspects of biodiversity.

Gerard Duvé, Fund for the Replacement of Animals in Medical Experiments

In half an hour, I planned and set up an expedition to the rainforest of Panama, and followed the day in the life of a bumble bee. Another exciting

feature of the Darwin Centre is its windows to the research areas. I had an interesting insight to the world of a tiny, insect-eating wasp, barely visible to the naked eye. What a great idea to be able to watch the researcher do his or her work and being able to talk to them on the intercom. The visit was rounded off with a spectacular photographic wildlife exhibition – what an exciting morning!

John Lowe, Institution of Mechanical Engineers

I came away with the clear understanding that life has found ways to specialise and survive that could have no other explanation than natural selection – but selection as a positive feature as much as "survival of the fittest" – matching specific development to precise opportunities. It came as a shock to find this translated to over 3,500 types of mosquito, each adapted to precise environments.

Professor Ian Henderson, University of Sheffield, Society for Endocrinology

The Museum, as a whole, has a

brehtaking collection of preserved species, living, extinct or as fossils. Members of the Committee were able to visit but a tiny fraction of the many displays and teaching and instructional items freely available to the public including lecture theatres and meeting rooms. A National assemblage of huge worth!

Alan Malcolm, Decibell Communications

The Cocoon is one approach to improving the image of scientists as ordinary people. As one walks down the ramp from the seventh floor, labs and scientists can be viewed through glass windows, and the occasional conversation can be undertaken. Recognising that not every bench will be inhabited every minute of the day, numerous video presentations with the missing scientists are readily available. Just try to imagine the public surprise when they discover that the "keeper of spiders" is a delightful young lady. Strongly recommended for a few hours' distraction.

IAN TAYLOR'S RECENT VISIT TO THE LARGE HADRON COLLIDER AT CERN, GENEVA, AND ITS RE-START ON 20 NOVEMBER



Ian Taylor MBE MP Chairman Parliamentary and Scientific Committee, United Kingdom (second from left) with (from left to right) CMS Technical Co-ordinator A. Ball, CMS Spokesperson Professor Tejinder (Jim) Virdee and Adviser to the Director-General Dr John Ellis.

Ian Taylor made a solo visit to meet the scientists who are hoping to unlock the secrets of the Universe. This involved there-and-back flights from London City and Geneva on Monday 2 November. As Chairman of the Parliamentary and Scientific Committee, he had been invited to visit the European Organisation for Nuclear Research (CERN) at the invitation of the Director

General, Professor Rolf Heuer, and organised by Marika Flygar his assistant. This was the last opportunity available for a visit prior to the beam operation restart on 20 November, and Ian was able to make a comprehensive and well organised visit to the world's most powerful particle accelerator, the Large Hadron Collider (LHC).



Ian Taylor MBE MP Chairman Parliamentary and Scientific Committee, United Kingdom, Professor Rolf Heuer, Director General CERN

Ian has been a supporter of the LHC from its outset. He is convinced that it is worth understanding why at the moment when things began there was a fraction more matter than anti-matter, an imbalance to which we owe our existence. His support is appreciated by Dr John Ellis, the CERN Adviser for Non Member States, who thanked Ian for taking the time and effort to visit CERN and wrote "the people whom you met were impressed by your interest and involvement. We do not forget that you set the UK on the road to the LHC!"

Ian summarised his visit as follows: "I was met by Wendy Korda, VIP and Protocol Officer who helped with the detailed arrangements for my visit – as she had done during my previous visit when Science Minister in 1995. I was transported from the airport directly to CERN Point 5 where I was greeted and welcomed by Dr Rolf Heuer, Director General; Dr Steve Myers, Director for Accelerators and Technology; Professor Felicitas Pauss, Co-

ordinator for External Relations; Dr John Ellis, Adviser for Non Member States; and Professor Tejinder (Jim) Virdee, Content Management System (CMS) Collaboration Spokesperson, Imperial College. We then walked through the CMS Control Room to the lift and descended to visit the CMS underground Experimental Area under direction of Professor Tejinder Virdee.

The scale of the engineering and electronics triumph has to be seen to be believed, and the specialist firms involved in fabricating and installing the collider are based in a long list of countries. There are many potential spin-offs from the equipment designed for the LHC which I am sure will be available to a wider commercial and public benefit. Back on surface, we then had a working lunch hosted by Dr Heuer in the Glassbox Restaurant, followed by a visit to the CERN Control Centre and a final round table discussion prior to departure for the airport. In all, I was briefed on the four key experiments

that the LHC team are conducting. Maybe by the time this article is read, the Higgs Boson will have been identified and more information about dark matter discovered. I can recommend this visit to all my Parliamentary colleagues."

LHC BACK IN BUSINESS

Particle beams are now once again circulating in the world's most powerful particle accelerator, the LHC. A clockwise circulating beam was established at 9pm GMT on the evening of 20th November. This is an important milestone on the road towards first physics at the LHC, expected in 2010. "It's great to see beam circulating in the LHC again," said Professor Rolf Heuer. "We've still got some way to go before physics can begin, but with this milestone we're well on the way." The LHC circulated its first beams on 10th September 2008, but suffered a serious malfunction nine days later. A failure in an electrical connection led to serious damage, and CERN has spent over a year repairing and consolidating the machine to ensure that such an incident cannot happen again.

The UK is one of the biggest contributors to the LHC project. Through the Science and Technology Facilities Council (STFC), which funds the UK particle physics programme, including the CERN subscription, the UK has contributed vital hardware, computing and scientific knowledge and has around 150 UK scientists currently involved in the experiment. The STFC has invested over £500 million over the lifetime of the LHC project, through the UK subscription to CERN and funding of the UK institutes that have been involved in the construction of the detectors and provision of the computing Grid. STFC

Rutherford Appleton Laboratory has been a key element of this work.

Professor Keith Mason, CEO of the STFC said, "The LHC's particle collisions could help us find out if dark matter exists, whether there are extra dimensions of space-time and why some particles have mass. Whether the LHC confirms or denies leading theories, its results will start a new age in our understanding of physics and the entire Universe." The LHC reached its operating temperature of 1.9 Kelvin, or about -271 Celsius, on 8th October. Particles were injected on 23rd October, but not circulated. A beam was steered through three octants of the machine on 7th November, and circulating beams re-established.

LATEST FROM THE LHC RE-START AS SEEN BY ALICE

British scientists will withdraw from the ALICE experiment to crash heavy ions together at the LHC due to the latest round of financial cuts, which suggests that the ringfence was not as robust as scientists hoped. Professor Brian Foster, head of particle physics at Oxford University, said: "This is a sad day for British science: the Prime Minister should hang his head in shame." Nuclear physics is facing a 52% cut that will force withdrawal of British scientists from international projects and cancel seven that were planned for the future. "These out-of-proportion cuts have the potential to kill off the UK skills base in nuclear physics," said Professor Paddy Regan of Surrey University.



HOUSE OF COMMONS SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

On 1 October 2009 the Innovation, Universities, Science and Skills Committee became the Science and Technology Select Committee with the same members and Chairman. Under the House's Standing Orders, the Committee's remit is to examine the "expenditure, administration and policy" of the Government Office for Science and its associated public bodies.

The current Members of the Science and Technology Committee are:

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 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.

Setting the scene on science, engineering and technology issues across government

On 14 October 2009 the Committee took evidence on *Setting the scene on science, engineering and technology issues across government* from Lord Drayson, Minister of Science and Innovation, Department for Business, Innovation and Skills, and Professor John Beddington, Government Chief Scientific Adviser.

On 21 October 2009 the Committee held a seminar on its programme of work up to the General Election, which was attended by around 20 representatives of the learned societies and STEM policy organisations. A note of the seminar was published as an annex to the Committee's report on *The work of the Committee in 2008-09* on 15 December 2009.

CURRENT INQUIRIES

Evidence Check 2: Homeopathy

In preparation for the establishment of the Science and Technology Committee on 1 October, the former IUSS Committee commissioned work to assess the Government's use of evidence in policy-making. The Committee wrote to the Government on a number of topics and asked two questions: (1) What is the policy? (2) On what evidence is the policy based? The Committee considered the responses and selected Early Literacy Interventions for its first inquiry in the series (see below) and Homeopathy for its second.

The Homeopathy inquiry was announced on 20 October 2009 and the issues on which the Committee invited evidence were:

- Government policy on licensing of homeopathic products;
- Government policy on the funding of homeopathy through the NHS; and
- the evidence base on homeopathic products and services.

On 25 November 2009 the Committee took

evidence on *Homeopathy* from Professor Jayne Lawrence, Chief Scientific Adviser, Royal Pharmaceutical Society of Great Britain; Robert Wilson, Chairman, British Association of Homeopathic Manufacturers; Paul Bennett, Professional Standards Director, Boots; Tracey Brown, Managing Director, Sense About Science; Dr Ben Goldacre, Journalist; Dr Peter Fisher, Director of Research, Royal London Homeopathic Hospital; Professor Edzard Ernst, Director, Complementary Medicine Group, Peninsula Medical School; Dr James Thallon, Medical Director, NHS West Kent; and Dr Robert Mathie, Research Development Adviser, British Homeopathic Association.

On 30 November 2009 the Committee took further evidence from Mr Mike O'Brien QC MP, Minister for Health Services, Department of Health; Professor David Harper CBE, Director General, Health Improvement and Protection and Chief Scientist, Department of Health; and Professor Kent Woods, Chief Executive, Medicines and Healthcare Products Regulatory Agency.

The Report is currently being prepared.

Bioengineering

On 4 November 2009 the Committee announced an inquiry into bioengineering. The Committee is examining how the UK can maintain a globally competitive position in emerging and existing bioengineering research fields. The inquiry will take synthetic biology, stem cells and genetic modification (GM) as areas within which to explore the issues of research, translation and regulation. The deadline for written submissions was 4 December and the Committee held its first oral evidence session on 6 January, and plans a further session in January. On 6 January the Committee took evidence from Professor Douglas Kell, Chief Executive, Biotechnology and Biological Sciences Research Council; Professor Richard Kitney OBE FREng, Co-Director, Centre for Synthetic Biology and Innovation, Imperial College, London; Professor Sir Martin Evans, Professor of Mammalian Genetics, Cardiff University; Dr Ray Elliott, Head of Strategic Projects, Syngenta; and Professor Chris Mason, Chair of Regenerative Medicine Bioprocessing, University College London.



The regulation of geoengineering

On 5 November 2009 the Committee announced an inquiry into the regulation of geoengineering. The inquiry follows on from the major inquiry that the Innovation, Universities, Science and Skills Committee completed in March 2008, *Engineering: turning ideas into reality*, which took 'geoengineering' as a case study. The Report examined activities specifically and deliberately designed to effect a change in the global climate with the aim of minimising or reversing man-made climate change. Building on the earlier work the new inquiry will examine the regulation of geoengineering, specifically, is there a need for international regulation of geoengineering and geoengineering research and if so, what international regulatory mechanisms need to be developed; how should international regulations be developed collaboratively; and what UK regulatory mechanisms apply to geoengineering and geoengineering research and what changes will need to be made for purpose of regulating geoengineering? The deadline for written submissions was Wednesday 9 December and an evidence session is planned for January 2010.

The Committee's inquiry into the regulation of geoengineering is being co-ordinated with an inquiry into geoengineering by the US Congressional Science and Technology Committee.

REPORTS

The Government's review of the principles applying to the treatment of independent scientific advice provided to government

On 14 December 2009, the Committee published its Third Report of Session 2009-10, *The Government's review of the principles applying to the treatment of independent scientific advice provided to government*, HC 158-I.

Following the dismissal of Professor David Nutt, chairman of the Advisory Council on the Misuse of Drugs, the Committee issued a call for evidence on 25 November 2009, inviting views on the statement made on 6 November 2009 by a number of senior scientists including Lord Rees. This statement included a set of principles which covered academic freedom, independence of operation, and proper consideration of advice. The Committee considered the responses before preparing and publishing its own Report as a contribution to the Government's review.

The work of the Committee in 2008-09

On 15 December 2009, the Committee published its First Report of Session 2009-10, *The work of the Committee in 2008-09*, HC 103.

Evidence Check 1: Early Literacy Interventions

On 18 December 2009, the Committee published its Second Report of Session 2009-10, *Evidence Check 1: Early Literacy Interventions*, HC 44.

The Committee issued a call for evidence on 16 October 2009, inviting views on:

- the Government's policy on literacy interventions for school children with reading difficulties
- the evidence base for the Every Child a Reader and Making Good Progress programmes

- the definition of dyslexia
- the evidence base for diagnosing dyslexia and teaching dyslexic children to read.

On 4 November 2009 the Committee took evidence on *Early Literacy Interventions* from Professor Bob Slavin, Director of the Institute for Effective Education, University of York; Jean Gross, Director, Every Child a Chance Trust; and Professor Greg Brooks, Research Director, Sheffield National Research and Development Centre, University of Sheffield; Dr Chris Singleton, Director, Lucid Research Ltd; Professor Julian Elliott, Director of Research in the School of Education, Durham University; and Shirley Cramer CBE, CEO, Dyslexia Action. On 9 November, the Committee took further evidence from Ms Diana R Johnson MP, Parliamentary Under-Secretary of State for Schools; and Carole Willis, Director of Research and Analysis, Department for Children, Schools and Families.

GOVERNMENT RESPONSES

Spend, spend, spend? – the mismanagement of the Learning and Skills Council's capital programme in further education colleges: Government Response to the Innovation, Universities, Science and Skills Committee's Seventh Report was published (HC 530) on 19 October 2009.

Sites of Special Scientific Interest: Government Response to the Innovation, Universities, Science and Skills Committee's Tenth Report was published (HC 717) on 19 October 2009.

Students and Universities: Government Response to the Innovation, Science and Skills Committee's Eleventh Report was published (HC 170-I) on 20 October 2009.

Putting Science and Engineering at the Heart of Government Policy: Government Response to the Innovation, Science and Skills Committee's Eighth Report was published (HC 168-I) on 26 October 2009.

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 (appointed on 26 November 2009) are 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, 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 has been co-opted to the main Committee for the purposes of its inquiry into setting science and technology research funding priorities. Lord Jenkin, Lord Oxburgh and Lord Tombs have also been co-opted to a re-constituted Sub-Committee I for the purposes of a short inquiry into radioactive waste management.

SETTING SCIENCE AND TECHNOLOGY RESEARCH FUNDING PRIORITIES

An inquiry into the setting of science and technology research funding priorities was launched in July 2009. The inquiry is being 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 is investigating a range of issues including how decisions about funding research are made 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 commenced on 28 October. The sessions will run until 4 February 2010 when the Committee will hear evidence from the Science Minister, Lord Drayson, and Professor Adrian Smith, Director-General for Science and Research at the Department for Business, Innovation and Skills. The Committee is due to report in spring 2010.

RADIOACTIVE WASTE MANAGEMENT: A FURTHER UPDATE

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

The Sub-Committee will look at the Committee on Radioactive Waste Management and its function to scrutinise and advise on the implementation of the Government's Managing Radioactive Waste Safely Programme. The Sub-Committee will conduct a one-off evidence session in

February 2010, and is expected to publish its report in spring 2010.

GENOMIC MEDICINE

During the 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 6 July 2009. The Government response to the report 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 of Clinical Excellence, representatives of the pharmaceutical industry and representatives of the insurance industry. 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 will be debated in the House either during the current session of Parliament or early in the next session.

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.

The inquiry covered food products, additives and supplements, food contact materials, food manufacturing processes, animal feed, and pesticides and fertilisers. It investigated 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 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. It is expected that the report will be debated in the House during the next session of Parliament after the Government response to the report is published.

PANDEMIC INFLUENZA

On 24 June 2008 the Committee decided to conduct a brief follow-up to its 2005 report on pandemic influenza (Session 2005-06, HL Paper 88). As a result, on 25 November 2008 the Committee took evidence from Dawn Primarolo MP, then Minister of State for Public Health at the Department of Health, and also from officials from the Department of Health, the Cabinet Office, the Department for the Environment, Food and Rural Affairs and

the Department for International Development. The Minister and officials were invited to answer questions about the United Kingdom's preparedness for influenza pandemic and whether the National Health Service was adequately resourced in the event of an outbreak, and also to give their view on how essential public services would cope with a large-scale loss of staff due to illness caused by pandemic influenza. The Committee received expert briefing at a seminar in February 2009 and held a further evidence session with Government officials on 17 March. The Committee held a second evidence session with the Minister of State for Public Health, Gillian Merron MP. The Committee's report was published on 28 July and was debated in the House on 7 December.

FURTHER INFORMATION

The written and oral evidence to the Committee's inquiries mentioned above, as well as the Calls for Evidence, 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.



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 is a summary of papers produced for Members of Parliament.

Marine and Coastal Access Bill [HL]: Committee Stage Report

Research Paper 09/79

This is a report on the House of Commons Committee Stage of the Bill. It complements Research Paper 09/56, which was prepared for the Commons Second Reading.

The Bill would set up a new Marine Management Organisation (MMO); streamline marine licensing; introduce marine planning; reform fisheries management; provide for Marine Conservation Zones; and enable the creation of a route for walkers around the English coast. The Bill received Royal Assent on 12 November 2009.

Climate Change: The Copenhagen Conference

Research Paper 09/87

This paper covers the lead up to the United Nations Framework Convention for Climate Change (UNFCCC) conference on climate change that took place in Copenhagen from 7 to 18 December 2009. The aim of the conference was to reach an agreement on a Kyoto Protocol

successor that would ensure global reductions in greenhouse gas emissions beyond 2012.

Energy Bill

Research Paper 09/88

The Bill would introduce: a carbon capture and storage incentive to support the construction of up to four UK demonstration projects, to be chosen in a competition; mandatory social price support to lower energy bills (social tariffs) for the most vulnerable, which would replace the current voluntary agreement which expires in 2011.

It would also add ensuring security of supply and protecting consumers to the objectives of the regulator, Ofgem; increase the regulator's powers to deal with exploitation of electricity distribution constraints by generators; and increase Ofgem's power to fine companies. It would give the Secretary of State the power to ban cross-subsidy between gas and electricity accounts.

Flood and Water Management Bill and Flood and Water Management Bill: Committee Stage Report

Research Papers 09/91 and 10/08

There has been growing pressure to introduce



legislation to address the threat of flooding and water scarcity – both are predicted to increase with climate change.

The Government published a draft Flood and Water Management Bill in April 2009, and the Environment, Food and Rural Affairs Select Committee undertook pre-legislative scrutiny of the document. The Committee welcomed a number of the proposals, but it was concerned that a lack of parliamentary time would undermine the introduction of a comprehensive Bill. The Government introduced a slimmed-down version of the Bill on 19 November 2009.

The Bill would: require the Environment Agency to create a National Flood and Coastal Erosion Risk Management Strategy, which a number of organisations will have to follow; require lead local flood authorities to create Local Flood Risk Management Strategies; enable the Environment Agency and local authorities more easily to carry out flood risk management works; introduce a more risk-based approach

to reservoir management.

The Bill would also: change the arrangements that would apply should a water company go into administration; enable water companies more easily to control non-essential uses of water, such as the use of hosepipes; enable water companies to offer concessions to community groups for surface water drainage charges; require the use of sustainable drainage systems in certain new developments; introduce a mandatory build standard for sewers.

Sunbeds (Regulation) Bill

Research Paper 10/07

The Bill is a Private Member's Bill introduced by Julie Morgan MP and has Government support. The Bill seeks to create a duty on sunbed businesses to prevent use of sunbeds by under-18s, to provide for local authority enforcement of this duty, and to give Ministers powers to make regulations imposing further conditions on commercial sunbed use.



PARLIAMETARY OFFICE OF SCIENCE AND TECHNOLOGY (POST)

RECENT POST PUBLICATIONS

Biodiversity and Climate Change

October 2009

POSTnote 341

The effects of climate change on biodiversity are already evident in the UK, and with continued climate change, are expected to increase. This POSTnote explores the observed and future impacts of climate change on biodiversity. It also examines the relationship between biodiversity and adaptation to a changing climate.

Coastal Management

October 2009

POSTnote 342

Predicted sea level rise and higher storm surges will increase the risk of coastal erosion and flooding. In response to this challenge, flood and coastal erosion risk management is undergoing direction and policy change. This POSTnote examines past and present coastal management policy and the main issues arising for the future English coastline.

Ocean Acidification

October 2009

POSTnote 343

The increasing amount of carbon dioxide (CO₂) in the atmosphere is acidifying the oceans. The resulting changes to ecosystems and marine biodiversity may have negative impacts on fisheries and food security and reduce the coastal protection provided by coral reefs. This POSTnote outlines the science behind ocean acidification and summarises the threats to the marine environment.

Deforestation

October 2009

POSTnote 344

International attention is focused on ways to reduce deforestation,

prompted by concerns over greenhouse gas emissions and biodiversity loss. However the underlying causes of deforestation are rooted in current economic and development paradigms. This POSTnote looks at the reasons why deforestation occurs and the impact it has on the environment, as well as examining policies to reduce it.

Teaching Children to Read

October 2009

POSTnote 345

Reading is the gateway to learning; without it, children cannot access a broad and balanced curriculum. Dyslexic difficulties are associated with negative educational, employment and economic outcomes, making reading-related issues relevant to various policy domains. This POSTnote explains the reading process and the underlying basis of specific reading difficulties. It also summarises different methods of reading instruction, and examines their use in the context of current and possible future policy directions.

Technology for the Olympics

December 2009

POSTnote 346

From 27th July to 9th September 2012 around 14,500 athletes from 200 nations will compete in the London 2012 Olympic and Paralympic Games. Almost 10 million tickets will be sold and hundreds of millions will view the games remotely. Technological challenges range from ensuring that every event is available to viewers on-demand, to ensuring that the emergency services' radio network can function reliably. This note looks at technology plans for the games, focusing on information communications technology.

CURRENT WORK

Biological Sciences – Assisted Reproduction, Single Embryo Transfer, Animal Cruelty and Interpersonal Violence, Counterfeit



Medicines, Deception Detection Technologies and Diagnosing Dementia

Environment and Energy – Security of Energy Supply, Future Electricity Transmission, Pollinating Insects, Global Carbon Emissions Trading Scheme, Renewable Heating and Cooling and Environmental Limits

Physical Sciences and IT – Digital Preservation, Disruption of the Internet, Space Debris, Space Weather and Lighting Technology

CONFERENCES AND SEMINARS

Beyond 2010: Halting UK Biodiversity Loss

2010 Biodiversity Target is an agreement through the Convention on Biological Diversity to significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth. The Target is now also incorporated into the Millennium Development Goals. The UK has committed itself to a stricter target: to halt the loss of biodiversity by 2010.

In October 2009 POST, the British Ecological Society (BES) and the Institute of Ecology and Environmental Management (IEEM) held an event to discuss progress made in meeting the 2010 biodiversity target in the UK; why biodiversity is important; possible successors to the 2010 target; and the UK Government's policy and action on addressing biodiversity loss. While the 2010 target to halt biodiversity loss in the UK and in Europe has been successful in mobilising action, it is widely acknowledged that it will not be met. The evening was chaired by Lord Selborne FRS, with speeches from: Sarah Robinson, IUCN-UK National Committee, speaking on behalf of Sebastian Winkler, Head of Countdown 2010; Pavan Sukhdev, leader of the 'TEEB' (the economics of ecosystem services and biodiversity) study, and Professor Robert Watson, Chief Scientific Advisor to the UK Government Department of Environment, Food and Rural Affairs.

An audience of over 120 academics, representatives of NGOs, government departments and agencies, delegates from business and politics attended the event, which saw the launch of a position statement by the British Ecological Society and the Institute of Ecology and Environmental Management, setting out the role of science and professionalism in 'Conserving and Managing Biodiversity Beyond 2010'. One recurring theme, from both speeches and the question and answer session which followed, was the importance of generating widespread recognition of the true value of biodiversity and ecosystem services among the wider public and departure from a 'business-as-usual' approach.

Science, Parliaments and Africa

In November 2009 this seminar brought together members and staff from the UK and other European parliaments, civil servants, researchers, development practitioners and funders to focus on science in African parliaments. They discussed why parliamentarians need access to research information and explored some of the challenges in bridging the gap between researchers and parliamentarians. The capacity building activities which POST, the International Network for the Availability of Scientific Publications (INASP) and other partners have been carrying out were highlighted. Speakers at this event were:

- Professor Moses Bockarie, Director of the Centre for Neglected Tropical Diseases at the Liverpool School of Tropical Medicine;
- David Dickson, Director, Scidev.net;
- Dr Chandrika Nath, Adviser, POST;
- Dr Julius T Mugwagwa, Visiting Scholar, Open University.

Factors Affecting Political and Public Engagement in Energy and Climate Change

In December 2009 POST and the Westminster Energy Forum hosted an event to give parliamentarians the opportunity to discuss a number of public engagement and political leadership issues in climate change. Speakers at this event included:

- Fiona Sansom, Head of Campaigns, Department of Energy and Climate Change;
- Kate Smith, Head of Government Affairs, Shell International;
- Carola Hoyos, Senior Energy Correspondent, Financial Times
- Professor David Cope, Director, POST

Science, Technology and Innovation for Poverty Reduction

In December 2009 POST collaborated with the Institute of Physics and the Engineering and Physical Sciences Research Council to host an event on the crucial role that science, technology and innovation play in alleviating poverty. The seminar showcased promising new areas of UK research in developmental sciences, covering a range of areas including mobile communications, disease control, and provision of clean water and electricity. It addressed the challenges faced in ensuring that research is focused on the needs of the world's poorest people and explored social and cultural factors affecting the uptake of new technologies in developing countries. Attendees had the opportunity to look at practical demonstrations and network with researchers.

WORK FOR SELECT COMMITTEES

Houses of Parliament

Dr O'Brien conducted research for the preparation of a 4-5 day itinerary for a forthcoming mission to the USA by members of the British American Parliamentary Group on climate change and the automotive industry.

House of Commons

Environment, Food and Rural Affairs: Dr Jonathan Wentworth provided advice on questions for the pre-appointment hearing of the Chair of Natural England.

Energy and Climate Change: Dr Michael O'Brien continued assistance to the committee and prepared an extensive written briefing on options for generating electricity from the river Severn.

International Development: Dr Sarah Bunn provided a briefing on maternal health in Nepal for the inquiry on the Department for International Development's programme in Nepal.

Welsh Affairs: Dr Martin Griffiths provided technical assistance to the committee on its inquiry into Digital Inclusion.

STAFF, FELLOWS AND INTERNS AT POST

Special House of Commons Energy and Climate Change Committee Fellowship

POST and the Commons Energy and Climate Change

Committee have concluded an agreement with the Grantham Institute for Climate Change at Imperial College, London, whereby the Institute will support a series of fellows dedicated to working either with the committee or with POST directly. Two Grantham Institute fellows have so far participated; Dr Greg Offer, who worked with the committee, and Alex Dunnett, who worked with POST on Renewable Heating and Cooling.

Special House of Commons Health Committee Fellowship

Lisa Hinton, from the University of Oxford, a fellow supported by Medical Research Council, began working with the House of Commons Health Select Committee on its inquiry on Commissioning.

Conventional Fellows

Richard Gunn, Imperial College London, Engineering & Physical Sciences Research Council Fellowship

Sarah Hards, York University, Economic & Social Research Council Fellowship

Sharon Lin, City University, National Endowment for Science, Technology and the Arts Fellowship

Helen Parker, Cambridge University, Medical Research Council Fellowship

Rebecca Ross, Oxford University, British Ecological Society Fellowship

Interns

Adam Freeman Pask, a Master's degree in Science Communication student at Imperial College London, joined POST for a 3 week internship to work on podcasting.

Alice Blachford, an Oxford University undergraduate, worked during autumn at POST, particularly on preparing material for POST's special post-election publication, *Science in the New Parliament*.

INTERNATIONAL ACTIVITIES

The main activity during the reporting period was POST's hosting of the 2009 annual conference of the European Parliamentary Technology Assessment network, with a two-day conference in early November, on the theme *Images of the Future*, held in the Attlee Suite. The conference dinner was sponsored by the Science and Technology Facilities Council and held at the Old Library, Queen Mary, University of London, after a special visit to the newly-opened Centre of the Cell.

The conference was attended, among others, by a record number of parliamentarians from European parliaments (including the overall President of the Catalan Parliament, Spain) and, totally unprecedentedly in its 19 years of occurrence, by the Chairs of both the US House of Representatives' Science and Technology Committee and of the same committee at the Korean Parliament.

Other significant outcomes during the event were the acceptance of membership of the new technology assessment unit of the Swedish Parliament and an approach for associate membership from the Science and Engineering assessment units of the US Government Accountability Office.

In mid-November 2009 the Director was invited by the Science Division of UNESCO to make a keynote presentation at the World Science Forum in Budapest on parliamentary technology assessment.

A remarkable development in the period has been the three requests in as many months that POST has received originating either from the Chinese Embassy in London, or directly from agencies in China, to make presentations on its work to delegations of visiting experts and politicians from across China. These delegations have numbered between 15 and 25. POST has had a steady stream of Chinese missions over the past decade but never of such a size.

POST African Parliaments Programme

Capacity building activities continue in Uganda with the emphasis now being on encouraging activities that can be driven from within the country. POST and INASP supported a workshop on "finding and using scientific and technical information" for parliamentary staff in Kampala in November 2009, organised largely by the staff themselves. This was a follow up to the workshop on information literacy organised by Dr Newman (and part funded by POST) in August 2009.

POST continues to fund the Ugandan National Academy of Sciences to deliver a programme of networking activities between parliament and the scientific community (including MP-scientist pairing).

POST is co-ordinating links with other Westminster-based organisations working with African parliaments, such as the Commonwealth Parliamentary Association, to identify synergies and limit duplication.

WITH SUCH MINERAL WEALTH, WHY IS TANZANIA NOT RICHER?

Martin Caton MP
Vice Chair, All-Party
Parliamentary Group for Earth
Sciences

Dr David Hargreaves
(Director, Fairtrade Gemstones)
and Liv Carroll (Senior Geologist,
Wardell Armstrong) addressed
parliamentarians and mining
geologists, mining engineers and
gemstone mine owners, many

having Tanzanian mining
experience, with representatives
from the oil, gas, and coal
industries and jewellers and
gemmologists. The geography
and geology of the country were
described together with the

political and financial systems,
including mineral wealth from
gold, nickel, tin, copper, uranium,
coal; and gemstones, especially
gem quality diamond, ruby,
sapphire, emerald, garnet and
the blue-coloured tanzanite,



which is only found in Tanzania.

Why is this country, like most African states still so poor, with a long history of failing development, even though it has potential for hard currency exports, initially of high value minerals such as gold and gemstones, followed by exploitation of bulk minerals, including iron ore, coal, copper and nickel, although historical, cultural and political influences are barriers to economic enhancement? Tanzania, a former British colony, is twice the size of Spain, with a population of 40 million growing at 2% per annum with more than 40% under 15 years old. More than 80% of Tanzania's population is rural, with only 4% of the land cultivated. Agriculture is the economic mainstay, providing more than 60% of GDP (GDP per capita is approximately US\$1500) and 80% of employment. The Government aims for a 10% annual contribution from the mining sector to GDP by 2025. Giving up agricultural land and an established way of life for mining is not an acceptable alternative for many.

High value to weight ratio commodities, such as gold and gemstones, are attractive to both

large- and small-scale miners, which is critical in a country with poor infrastructure. Hargreaves mapped the distribution of gemstone occurrences which enable artisanal miners to recover stones that generate portable cash and support for a second tier of traders. Tanzanite was named by Tiffany and Co after the country and the only locality where this gemstone was discovered in 1967 near Mt Kilimanjaro. It is not possible to predict when this will be exhausted, which has increased interest in tanzanite as a finite product. Tanzanite, when found in the rough is brownish, but is transformed with heat treatment to a bright violet-blue. It is a good marketing tool that raises awareness of Tanzania's mineral wealth, though gemmologists claim that in spite of its exceptional colour the gemstone is easily scratched.

TanzaniteOne Ltd operates one of the four sections of the outcrop (Block C, at Merelani 70 km southeast of Arusha) and is in partnership with Tiffany & Co, New York to market the stones and ensure stable prices. Other sections are operated by artisanal miners resulting in a volatile market, with over 30,000 artisanal miners working

the tanzanite mining area in 1989. Over-supply in 1997 was followed in 1998 by heavy rains flooding artisanal shafts and killing hundreds of workers, resulting in extreme shortage in 1998. Prices have remained relatively high since that time, and TanzaniteOne and others have now established a regulated market.

Exploration for gold commenced in central and northern Tanzania in the late 1980s, and accelerated with change in government incentives that were incorporated into the 1998 Mining Code. Annual gold production is around 50 tonnes (1.6 million ounces), with over 65% from just five major gold mines. Artisanal mining of gold is common, with thousands of miners working in the Lake Victoria Goldfields. Dissatisfaction with the exploitation of national resources by the Canadian mining company Barrick at the North Mara mine led to mine invasions and destruction of heavy equipment. This generated criticism of the 1998 Mining Code, especially the 3% royalty which was too generous to the company and should be raised. The World Bank mining review 1990 was the precursor

of the current Tanzania Mining Code. Mining offers a kick start to the economy by inward investment, employment and taxation of the mined product. There are many countries that wish to attract similar investment, and creating a mining code offering a competitive environment for foreign direct investment is of primary importance.

The gemstone tanzanite is a good 'hook' with which to raise awareness of the country and its mineral wealth. Although working in Tanzania is expensive, improved infrastructure (from roads to government administration and taxation) will improve the investment outlook and may attract small to medium size companies that are conspicuously absent today and ultimately improve the wealth of the country.

I thank Cally Oldershaw, Group Administrative Secretary for organising the meeting and preparing this article and Dr David Hargreaves, Liv Carroll and Michael Forrest. See www.esef.org.uk for further information about the All-Party Parliamentary Group for Earth Sciences. The full article can be read on www.scienceinparliament.org.uk

LETTERS TO THE EDITOR

Dear Sir,

British Indian Ocean Territory

Professor Charles Sheppard (*British Indian Ocean Territory* 66/4) makes a strong case for enhancing conservation efforts in the Chagos archipelago which our organisation fully supports. However, Professor Sheppard appears intent on excluding native Chagossians from conservation initiatives by claiming that involving people in husbanding their habitats has been a failure. This fits conveniently with the British Government's refusal to countenance resettlement of the outer islands, but it does not sit comfortably with the overall evidence of the importance of community participation in conserving natural resources.

It is in recognition of her empirical work on the management of common access natural resources (particularly *Governing the Commons*, Cambridge 1990) that Elinor Ostrom has recently been awarded the Nobel Prize in Economics. Her work stresses not only the necessity of active community participation but also describes the cases where management by users has been more effective than government regulation.

On coral marine environments specifically, the United Nations Environment Programme study (*People and Reefs*, 2004) describes a number of case studies in successful community engagement in marine protected areas. Nearer to home, there have been successful community-based habitat regeneration and site preservation activities in Rodrigues Island as well as successful

training of fishing communities throughout Mauritius in conservation and monitoring.

In such vulnerable marine environments, the importance of training individuals and educating the wider community is clearly essential, as is the need for pro-conservation economic incentives within the community. These are lessons that the Chagos refugees have come to recognise, as well as the importance of an enforceable regulatory environment.

Our concern about Professor Sheppard's objectivity in dismissing the success of such community involvement is reinforced by his claim that a recent survey of Chagossians indicates that only a dozen individuals wish to return permanently. To our certain knowledge there has been no survey conducted in either Mauritius or the Seychelles, and our own consultations (published in *Returning Home: a proposal for the resettlement of the Chagos Islands*) suggest that there would be around 150 families with economically active members willing to return immediately, with a similar number prepared to wait a little longer before deciding on permanent return.

Yours sincerely

Olivier Bancoult OSK,
Chairman,
Chagos Refugee Group,
Port Louis,
Mauritius

Sir,

Debate on GM Foods

Listening to the debate on genetically modified foods on December 15th I was struck by the need to consider more the psychological aspects of research in areas of public interest where there is great pressure on researchers to produce results. Whilst it was touched upon by a number of speakers I think it needs more emphasis.

The main psychological principle of interest is that behaviour which is rewarded is more likely to be repeated. Funding of GM research is usually by those with a vested interest in its success. Both Government and commercial organisations fund GM research and want it to be successful. Those opposed to GM foods have little financial clout.

Researchers, in general, have a restricted field of interest. This means that they may not look for results in areas outside those areas. They are also usually most interested in short-term results and long-term effects may not be picked up. There are many instances where the unintended negative effects of decision far outweigh the intended good ones.

There is a high level of mistrust by the general public of both researchers and Governments where long term aspects are important. The pictures of John Gummer feeding his daughter British beef to assure the world of its "safety" readily come to mind. The precautionary principle needs to be remembered and respected.

Reg Sell

NEWS FROM THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE

Guide to Science in Parliament and Government

I am delighted to have this opportunity to announce the launch of the 3rd edition of this by now well-established web-based *Guide to Science in Parliament and Government* prepared by Dr David Dent, Vice President of the Parliamentary and Scientific Committee.

The two earlier editions of the *Guide*, which were placed for maximum exposure to all-comers on the Committee's website and freely available without charge to anyone who visits this site, have provided a unique and valuable source of information, unavailable elsewhere, concerning the manner in which science is managed by both Parliament and Government.

The extent to which the *Guide* has been accessed has also been continuously monitored to ensure that it is meeting the needs it is designed to address in a form that also meets the requirements of those with a need to know.

Important decisions which are made by Government and in Parliament are increasingly dependent on the receipt of accurate and reliable sources of information concerning both science and engineering. The recommendations are prepared and presented by those best qualified to do so, to the highest international standards, whether or not the Government subsequently decides to act on or partially or completely ignore this advice when making policy

decisions that affect us all. If Ministers decide to reject the advice of expert scientific bodies, it is hugely important that they spell out the reasons – something that has not always happened in the past.

It is therefore increasingly important in a democracy that the mechanism by which such specialist advice is received and translated into policy becomes as transparent as possible, partly in order to be able to understand any policy-based reasons given for ignoring the advice from specialists.

There are currently some seventy-five groups which exist to provide Government with specialist advice on science and engineering and it is therefore very important for all concerned in a democracy that the existence, working methods and importance of this relatively invisible, but vitally important network becomes as accessible as possible for the ultimate benefit of everyone concerned.

I have no hesitation in recommending the *Guide* to you all.

Patrick Jenkin

Rt Hon Lord Jenkin of Roding

President, Parliamentary and Scientific Committee

THE 2009 RSC BILL BRYSON SCIENCE PRIZES

The 2009 RSC Bill Bryson Science Prizes were awarded on the 28 October at a special reception in the House of Commons.

The competition aims to inspire and engage students and to encourage clear science communication in its widest form. Participants are asked to produce an original piece of work, in any format; entries are judged on how well they explain science to a chosen audience.

There were a huge number of entries this year.



Bill Bryson with some of the prize-winners at the reception in the House of Commons

The **Overall** winner was a stop-motion animation, *The other CO₂ problem*. Created by pupils from Ridgeway School, Plymouth the film shows the effects of ocean acidification caused by increasing levels of CO₂.

The **Secondary Schools** winner was Taunton School, Somerset - Science Magazine *The Pulse*.

The **Primary Schools** winner was Whitehill Junior School, Hertfordshire - Powerpoint reviewing experiments on growing radishes.

All winning entries can be seen on the Royal Society of Chemistry website at www.rsc.org/Education/BillBryson



SELECTED DEBATES AND PARLIAMENTARY QUESTIONS AND ANSWERS

Following is a selection of Debates and Questions and Answers from the House of Commons and House of Lords.

Full digests of all Debates, Questions and Answers on topics of scientific interest from both Houses of Parliament can be found on the website:

www.scienceinparliament.org.uk

Please log in using the members' and subscribers' password (available from the Committee Secretariat) and go to Publications: Digests

SCIENCE POLICY

Scientific Advisory Committees: Codes of Practice

Questions and Oral Answers on Monday 23 November

Lord Jenkin of Roding: To ask Her Majesty's Government whether they will review the Code of Practice for Scientific Advisory Committees, published in December 2007, and the Code of Practice of the Advisory Council on the Misuse of Drugs, last reviewed on 22 September.

The Minister of State, Department for Business, Innovation and Skills and Ministry of Defence (Lord Drayson): My Lords, I am

currently working with the Government's chief scientific adviser, colleagues across government and the wider scientific community to develop a set of principles to underpin the relationship between the Government and independent scientific advisers. We will consider in the light of this work whether there is a need to review the code of practice for scientific advisory committees.

It is for the ACMD to consider whether its own code of practice needs reviewing.

Lord Jenkin of Roding: That sounds encouraging, and I am grateful to the noble Lord. He must recognise – who better than he? – the profound dismay that was caused in the scientific

community around the events affecting Professor David Nutt. Is he aware that neither of the two codes referred to in the Question deal expressly with the particular problem that arose in that case? Is he also aware that I am delighted that he is looking at this in two ways: at the role of the scientists and the scientific advisory committees; and at the role of Ministers receiving advice, because that is what went wrong in that case?

Lord Drayson: The noble Lord is right that the particular circumstances in the case of Professor Nutt caused concern in certain parts of the scientific community. That is why it is so important for the Government to reiterate the importance of the independence of scientific advice, and to have clarity between the scientific community and the Government on the rules of engagement between the two. We regard the set of principles that have been proposed as an excellent starting point to look at this matter further and why we are consulting widely. We take this matter very seriously indeed.

Lord Walton of Detchant: My Lords, many years ago I was invited to give some scientific advice to the Government, not least as a member of the Southward working party on BSE. Does the Minister agree that one of the principles that should be embodied in the new guidance is that scientific evidence is the subject on which individual scientific committees and their members give advice to the Government? If it turns out that the evidence is contrary to the Government's view on a particular topic, may we be assured that the Government will not take punitive action against a scientist who happens to disagree with their view?

Lord Drayson: My Lords, it is important for me to restate the Government's position. It is absolutely the case that the Government recognise the central importance of the independence of scientific advice, and where that advice is taken. If the Government decide to go against that advice, and unless there are grounds, say, in the case of national security, they should explain why they have come to a different conclusion. That is one of principles proposed and it is an aspect on which we are consulting further.

Lord Taverne: I welcome the Minister's reply but could the Government not accept the guidelines and principles that have been put forward by 20 very eminent scientists, including the noble Lord, Lord Rees, who is president of the Royal Society? It is essential to make it clear that somebody who is a member of an advisory committee may publicly declare his views, and that if they contradict government policy they will not be sacked.

Lord Drayson: My Lords, as I believe I have already made clear, we regard these principles as an excellent framework. The majority of the principles are already enshrined in the code of practice which scientific advisers adhere to when providing advice to the Government but, as the noble Lord, Lord Jenkin, has already highlighted, certain aspects are not covered by the principles. We believe that the principles provide an excellent framework. They again set out some important pillars that underpin the relationship between science and government, but we believe that they need to be taken further. That is why we are working on consultation and will be making a statement on those principles before Christmas.

Lord Foulkes of Cumnock: My Lords, could my noble friend

ensure that when members are appointed to these committees, it is made clear to them exactly what "advisory" means, and that it must remain ultimately a decision for the elected Government of the day?

Lord Drayson: My noble friend makes an important point. The scientific community and the Government have to work effectively together. That requires absolute clarity about scientists' ability to give their independent advice and to talk about the advice that they give unless, as I say, there are security considerations. But in return there has to be understanding within the scientific community that Ministers make decisions based upon a number of elements of advice of which science is but one. Where that advice may differ from the decision, it is therefore incumbent on Ministers to explain why a different decision has been reached.

HEALTH

Complementary and Alternative Medicines

Debate in the House of Commons on Wednesday 14 October

David Tredinnick (Bosworth): I wish to consider the House of Lords Science and Technology Committee's report on complementary medicine 10 years on. I shall cover three points: regulation, how we can widen the number of therapies available in the NHS, and the case for more research.

The Committee first met in 1999 and its report states in section 5.53 "The Osteopathic and Chiropractic professions are now regulated by law. It is our opinion that acupuncture and herbal medicine are the two therapies" – which at this stage would most benefit from regulation. The Osteopaths Act 1993, mentioned in the report, has been a huge success, but there is a postcode lottery at work. Only 16 per cent of primary care trusts allow GPs to refer patients to osteopaths on the NHS and an additional 25 per cent allow GPs to refer patients in exceptional cases. That is wrong, and I ask the Minister to address the problem. Where osteopathy is used in the NHS, its use increases year on year, suggesting patient and GP satisfaction, so the barrier is in the approach of the primary care trusts.

Homeopathy has had a long tradition in the health service; it was actually used by Aneurin Bevan who helped to put it in the health service. However, homeopathy has been under attack, despite the new Royal London Homeopathic hospital. The hospital and those who support homeopathy have faced difficult times, not least the attacks by the so-called scientific establishment and a letter that purported to come from the NHS, it had the NHS logo on it, in May 2007 which was signed by many retired professors of medicine. That letter should never have been sent out under the NHS letterhead.

Attacks have also been made on the efficacy of homeopathy. A letter was sent to the World Health Organisation warning against the use of homeopathy, but it ignored the very clear randomised, double-blind trials that proved that it is effective in the particular area of childhood diarrhoea on which it was criticised. Will the Government therefore be robust in their support for homeopathy and consider what can be done so that it is used more effectively in the health service?

I would like the scope of complementary and alternative

medicine to be widened. The Government have done well with the guidelines from the National Institute for Health and Clinical Excellence that allow for osteopathy and chiropractic for lower back pain. That is definitely a step in the right direction. It has come about only because of the rigorous research carried out, resulting in acupuncture and, as I said, osteopathy and chiropractic being made available.

We now need to bring in other therapies and to ensure that they are made available. That can be done in different ways. The Complementary and Natural Healthcare Council has been set up to regulate some therapies, such as massage therapy, nutritional therapy, reflexology and aromatherapy. However, the numbers are less than expected. Can the Minister help in any way by publicising the benefits of this council to those who might join it?

The Minister of State Department of Health (Gillian Merron):

I congratulate David Tredinnick on securing this debate on the important matter of complementary and alternative medicine, which was the subject of an important report by the House of Lords Science and Technology Committee, which the Government welcomed at the time and responded to in 2001.

I hope that the hon Gentleman, whom I listened to carefully, will find it reassuring that the Government's position on complementary and alternative medicines, which I shall refer to as CAM, is the same as our position on mainstream medicines. First, decisions about care are best made by clinicians on the ground. Doctors and health professionals are best equipped to make the right choices for their patients, and local NHS services are best placed to decide which treatments will benefit their communities best. Secondly, the decision to embark on any course of treatment has to be made on the basis of robust clinical evidence. That means clinical trials, peer-reviewed papers, and guidance from the National Institute for Health and Clinical Excellence. Thirdly, the way in which the Department funds new research is through the National Institute for Health Research. The NIHR provides substantial funding for a wide variety of studies that meet strict scientific criteria and that reflect the needs of the national health service. Finally, we should always be open to new methods and ideas. That means using the NHS's world-leading innovation and research facilities to ensure that health professionals get the latest and best clinical information, and that patients get the best, safest care available.

Pandemic Influenza: S&T Committee Report

Debate in the House of Lords on Monday 7 December

That this House takes note of the Report of the Science and Technology Committee on Pandemic Influenza: Follow-up (3rd Report, Session 2008-09, HL Paper 155).

Lord Sutherland of Houndwood: I shall speak about the report of the Science and Technology Select Committee on pandemic flu and the Government's response to it. The report was an update by the committee on a report of October 2005. The follow-up report was published on 28 July this year. We thought it necessary because the reaction to our 2005 report left us with a number of concerns about the adequacy of government preparedness for the possibility of a pandemic outbreak. We had expected it to be a short and fairly quick report. However, the first evidence session did not convince us that all the questions that we thought ought to be

publicly aired had been, so we decided to extend our report and prepare for two further sessions in spring 2009. The first was in February, when we had an excellent team of specialists from the appropriate areas of science and medicine to work with and advise us. For the second, on 17 March 2009 and I stress the date, as it is important, we had departmental representatives and a ministerial presence.

One day later, on 18 March 2009, the virus H1N1 was identified in Mexico. That virus became known as possible "swine flu" because it could transmit from pigs to human beings and, as it turned out, from human beings to human beings. Therefore, the stage was set for some important and worrying consideration to be given to it. By 27 April, there was confirmation of cases in the USA, Canada and Spain, with suspected cases in several other countries including the UK. Within five or six weeks, we had moved from taking evidence on 17 March that was, in a sense, theoretical, for a table-based report, to a pandemic flu situation.

By 11 June, the World Health Organisation confirmed that we were at phase 6 alert in the pandemic period measurements, which was the first such alert for more than 40 years. Of course, that affected the nature of the Select Committee's work and the way in which it would go about its business.

Lord May of Oxford: Infectious diseases, viral, bacterial and others, have been with *homo sapiens*, and have killed lots of people, since we first invented agriculture, began to interact with domesticated and other animals and, most importantly, began to gather in large aggregates in villages and cities. We are still doing that.

We revisited the inquiry into pandemic flu not least because the first inquiry showed a marked confusion in the Department of Health as regards antivirals and antibiotics. Until just before the advent of H1N1, the policy was that antivirals, such as Tamiflu, would be given to people who had come into the surgery and been diagnosed with flu. The idea behind that is sensible if you are confused about antivirals and antibiotics because any agent will, if sufficiently used, provoke an evolutionary resistance; it is just a matter of time. The best defence against that is using the thing only when you really need to. That is true for antibacterials-antibiotics. Antivirals are effective if they suppress replication initially and give the natural immune system a bit of a jump start, but are best taken in the first 24 or 48 hours after infection. By the time you are really symptomatic and going to the doctor, the correct policy is to give them to your children or other contacts. In short, if you are dealing with something serious, the correct use of antivirals is targeted local prophylaxis; that is, giving them to other members of the family and other members of the schoolroom.

It took several years for this lesson to be absorbed in the Department of Health. Pleasingly, that followed immediately the advent of the first case of H1N1 swine flu in this country. Lord Darzi was able to reply by saying that the department had implemented this policy. It did not, of course, halt the spread of the virus, but were it more serious, doing that would buy you time.

Lord Jenkin of Roding: It is no secret that I was one of those who urged that the Select Committee should revisit its report of October 2005. Lord May has rehearsed at least one reason, there

were others, why it was thought that we should return to it, although there was at that stage no more than anxiety that we might face a serious pandemic flu outbreak. Therefore, I was immensely grateful to Lord Sutherland of Houndwood, when he, as chairman of the Select Committee, agreed. I was also grateful to be co-opted to serve on the committee. Of course, I echo his thanks and that of others. I was particularly impressed by the session that we had with five of the leading experts in the country on this subject.

Lord Tunncliffe (Government Whip): There must have been 100 questions and we shall try to cover them. I shall make an overview speech and then touch on the major issues raised.

I thank the noble Lord, Lord Sutherland, for tabling the Motion, and thank all members of his committee for their insightful report. It is a welcome recognition of the strength and quality of the UK's pandemic plans. The UK remains one of the leading global players in planning and preparing. WHO declared a global influenza pandemic on 11 June, which means that we have an entirely new virus. At the beginning, we have little information, and you cannot wait to see how it develops before deciding how to respond. That is why we invested so much time and effort in planning and preparing. But plans need to be adapted as information becomes available.

Throughout the pandemic we have drawn on national and international expertise to track how swine flu has developed. We have constantly adapted our approach and continue to do so. To date the pandemic has been milder than it might have been. Most illnesses continue to be mild. However, some people are much more seriously affected. Our best estimates for England suggest that around 790,000 people have been ill with swine flu. Tragically, as of 2 December, there had been 178 confirmed deaths. I express my sincere condolences, and those of the Government, to the families and friends of those who have lost their lives.

ENVIRONMENT

Water Management

Debate in the House of Lords on Tuesday 3 November

To ask Her Majesty's Government what measures they are putting in place regarding the management and conservation of rivers.

Lord Dear: My Lords, in introducing this debate, I thank those who are going to contribute to it and declare my own position in the question of rivers and angling: I am a keen salmon fisherman; I fish also for trout, in both cases, with variable success – and I am a member of the Salmon & Trout Association.

As many of us know, the European Union's water framework directive establishes a new and integrated approach to the conservation of our rivers and watercourses, and it introduces new, broader ecological objectives designed to protect aquatic ecosystems and, where necessary, to restore those that are damaged. However, in particular, it emphasises that it requires member states to bring all natural rivers up to a good ecological status.

There is a range of issues of concern, but I shall focus today on

one aspect of the water framework directive: barriers across rivers that obstruct the movement of fish and invertebrates. These are an important reason why many rivers are not achieving the ecological status that is sought. As I think most of us know, the ability to move up and down rivers is critical for migratory fish such as salmon, sea trout and eels, to name but a few. However, other fish species also migrate within the river system, and barriers such as weirs and dams can reduce their chances of spawning successfully.

Lord Davies of Oldham, Minister of State, Department for

Environment, Food and Rural Affairs: There is no doubt that water is an important resource that needs management. The Government demonstrated their commitment to its long-term management in our water strategy for England, *Future Water*, which we published in February 2008. *Future Water* sets out my department's long-term vision for water and the framework for water management. The strategy looks at the whole water cycle, from precipitation and drainage through to treatment and discharge, and considers matters such as the sustainable delivery of secure water supplies.

Water is commonly seen as an unlimited resource, but clearly it is not. Climate change presents that major problem. We all recognise the significance of the water directive. Certainly, a part of our strategy has to be encouraging the nation to recognise how valuable water is. *Future Water* outlined an ambition to reduce the average per capita water use to 130 litres per person per day by 2030. That is a pretty ambitious target, because it is 20 litres fewer than are used at present. On 24 September we launched a water efficiency campaign, under the "Act on CO₂" banner, which indicates the Government's determination to operate successfully there.

We all recognise that climate change imposes significant changes to our electricity generation. That is why we all appreciate the significant change in government policy regarding energy resource. However, hydropower's present contribution is very limited and we should not exaggerate how important it is. It is certainly green, and successful in those terms, but in comparison to those regions with significant hydropower resources that are easy to generate – Scandinavia is one obvious illustration. Britain's role is comparatively minor in our ability to operate hydropower. The Government are responsible for contributing half the cost of the billion pound programme to look at alternative energy strategies. Eleven major companies have each put in £50 million and the Government have put in the other £550 million to fund a programme to look at alternative strategies.

The Environment Agency plays an important role in the development of hydropower, but it has to balance a range of duties, with difficult decisions with regard to water use. We must balance the need for electricity generation against the necessity to protect fish. Some schemes may have a relatively minor impact on fish, but others might have a considerable impact. The Minister for Fisheries will lay an order this year on the provision of eel passes and screens. Eels are in a particularly parlous state and a number of obstructions prevent or reduce their upstream migration, thus constraining the colonisation of suitable habitats. It should be emphasised that not all obstructions need to be modified and I have no doubt that the Environment Agency will prioritise the most



critical barriers to migration. Measures for additional powers for the provision of fish passes and screens for other species will be laid in 2011.

Food Supply

Question and Written Answer on Tuesday 1 December

Mr Hayes (South Holland and The Deepings): To ask the Secretary of State for Environment, Food and Rural Affairs what recent research his Department has (a) commissioned and (b) conducted on the introduction of new crops and agronomic techniques intended to ensure the security of food supply.

Jim Fitzpatrick: DEFRA has invested in research on the development of improved pest and disease resistance, reduced input requirements, resilience to climate change and lower pollution outputs. The DEFRA Crop Genetic Improvement Networks (cereals, oilseed rape, pulses, vegetables, grasses, biomass crops) deliver research that allows selection of genetic resources for desired characteristics. DEFRA co-funds further research in partnership with industry (eg LINK) to transfer these characteristics into commercially viable crops.

DEFRA has also funded research generally in partnership with industry into improved agronomic techniques to develop whole-farm approaches that optimise production in terms of soil and nutrient management, precision agriculture, integrated management of crop diseases, pests and weeds, and improved water use efficiency.

ENERGY

Biofuels

Debate in Westminster Hall on Tuesday 27 October

Anne Main (St Albans): There is some dispute about the environmental impact of producing some biofuels, and Friends of the Earth raised some concerns, pointing out some worrying information that it had come up with during research on biofuels. Soy crops from the United States, Argentina and Brazil are used in the most common UK biodiesels and all contribute to the deforestation problem. The Friends of the Earth study assumed that 10 per cent of the food crops displaced by biofuels would be pushed on to land created by clearing forests. The researchers allocated the additional land to various agricultural uses and calculated the resulting extra emissions using established models. For example, clearing 1 hectare of Amazonian rain forest can release up to 1,000 tonnes of carbon dioxide into the atmosphere, according to the United Nations Intergovernmental Panel on Climate Change.

In response to those concerns, a spokesman for the Department for Transport recognised that there was some controversy and, while acknowledging that the biofuels evidence is evolving, said: "What is not in dispute is the need to develop new, cleaner fuels and break our dependence on oil if we are to tackle climate change. Some biofuels have the potential to help us achieve this. So whilst there is no case for pushing forward indiscriminately on those that may do more harm than good, it would be foolish to ignore any potential they do have. We have always been clear that biofuels can only make a useful contribution to mitigating climate change if they are sustainably produced." That is the crux of today's debate.

Are we foolishly ignoring a potential biofuel that is indeed extremely sustainable and sustainably produced? Few would argue that the production of biodiesel through the recycling of used cooking oil of UK origin is not a sustainable way to produce energy. We have only to look at our high streets to see how many restaurants and fast food premises use large quantities of cooking oils and fats, which then become a waste product, quite a tricky waste product, which is costly to deal with and dispose of.

David Kidney, Parliamentary Under-Secretary, Department of Energy and Climate Change: On the specific points made about recycled cooking oils and recycled ethanol, the use of waste and residues for energy is promising. With our concerns on direct and indirect land use change, it is a clear no-brainer, as everyone has said, to do much more with what we already have and to capture more of the UK's organic waste and residues that currently end up in landfill or, worse still, being disposed of illegally in rivers, as was recently exposed by a court case in Watford that concerned an incident last year in Welwyn Garden City. Instead, that waste should be used for bioenergy, whether for transport, heat or electricity. Next year, we will consult on potentially banning some organic waste from landfill, so that such materials can only be reused, recycled or used for energy generation.

Bioliquids, which are 100 per cent renewable, are rewarded through the renewables obligation. It is not the purpose of the renewables obligation to support fuels that are directly or indirectly derived from fossil fuels. Therefore, biodiesel produced using methanol derived from natural gas is not eligible for renewable obligation certificates, but it is eligible for support under the renewable transport fuels obligation, given the more limited potential sources of renewable transport fuel.

The Government are keen that our package of financial incentives for bioenergy provides coherent and appropriate long-term signals to the market. With the planned introduction of the feed-in tariffs and the renewable heat incentive, which will join the renewable transport fuels obligation and the renewables obligation, we are looking carefully at how we can best achieve that.

In conclusion, achieving our ambitious targets on renewable energy and on emissions reduction will require the participation of all parts of our society. The Government are working hard to support the wide range of emerging technologies, such as advanced biofuel and bioliquids, and remain vigilant that the UK's biomass supplies are sourced sustainably. We hope that, in the coming years, everyone from the largest multinational company to the individual householder will play a full and rewarding role in the UK's move to a low-carbon economy.

Oil and Gas

Debate in Westminster Hall on Thursday 29 October

Paddy Tipping (Sherwood): I am delighted to speak about the first report of the Energy and Climate Change Committee. As the first report of this new Select Committee, it is the first bit of work that we have undertaken, and we now have a 100 per cent record: we have produced a report and are having a debate about it in Westminster Hall.

The Select Committee believes that we must move to a low-carbon economy, and that we must decarbonise our generating

industry. At the same time, there is practical acknowledgment that the UK continental shelf will continue to provide oil and gas resources for a long time. It is vital, therefore, that we make best use of those resources. There are real concerns about the future of our energy policy. The Government's energy policy depends on three pillars: first, the need to combat climate change; secondly, affordable products for consumers; and thirdly, security of supply. It is security of supply that I want to turn to first.

Last year, in 2008-09, 40 per cent of our gas was imported, and figures from the Department of Energy and Climate Change suggest that 60 per cent of the UK's gas needs could be met from imports by 2020. That is a remarkable change-around from being a net exporter of gas. The situation is highlighted and put into profile by the difficulties with the transmission and export of gas. The dispute between Russia and Ukraine about the transport of gas was an issue primarily for Ukraine but one that affected major economies in western Europe. Gazprom is a good company in many respects, but people who have dealings with it and the Russian economy are concerned about the transparency and openness of the gas market there. To be so heavily dependent on gas from abroad, particularly from Russia, may not be a wise way forward.

Charles Hendry, Shadow Minister, Energy and Climate Change: (Wealden) I speak not only as the Conservative Front-Bench spokesman on this issue, but as a member of the Select Committee. It is a young Committee, but it has hit the ground running. It has already done valuable work. It is extremely well supported by the Clerks and officers, who have given some outstanding briefings. It has shown it is prepared to deal with the difficult issues. Many easier issues than this could have been adopted for the first report, but this is one of the most important issues for energy policy in Britain, and in Scotland in particular. It is to its credit that the Committee has put forward a report that is unanimous and meaningful. Sometimes it is difficult to achieve those two together.

The North Sea and the oil and gas sector are often the forgotten element in energy policy. For all involved in this report and all those in Parliament, the oil and gas sector has been there for the whole of our political lives. It is sometimes taken for granted that, because it has worked well and has been successful, it will inevitably go on doing so. We must recognise the massive contribution the sector has made. In total, it has paid £271 billion in taxes. This year, it will pay £7 billion in taxes, which will account for a quarter of all the corporation tax collected in the UK. It provides between 65 and 70 per cent of the country's primary energy demand. We all join the Minister and Simon Hughes in paying tribute to the industry for its achievements, for driving forward investment and for the exceptional courage of all who work in the sector.

We have discussed gas storage, which is one of the big challenges that the Government have to face. This country is critically short of gas storage. We have capacity for only a couple of weeks, compared with about 100 days in Germany and 120 days in France. If all the projects that were planned to be built by 2012 were constructed on time, our gas storage would be increased by just five hours. That brings home how much more must be done. We will inevitably become increasingly dependent on imported gas.

The involvement of Russia has been mentioned. We currently import about 2 or 3 per cent of our gas from Russia. That will almost certainly rise. We need to get a better understanding of the importance that gas will have in the mix in coming years. Paddy Tipping said that 60 per cent of our gas could be imported by 2020. In "The UK Low Carbon Transition Plan", the Government say that the figure will be only 40 per cent, whereas others say that it could be as high as 80 per cent. That is a wide range. The answer has important implications for the amount of gas storage that the country will need. We have facilities and areas where gas can be stored, but we must drive forward the investment.

David Kidney, Parliamentary Under-Secretary, Department of Energy and Climate Change: The price of oil went to a high of \$146 a barrel last year and then slumped to between \$30 and \$40 earlier this year. It currently stands at between \$70 and \$80. Given that the costs of delivering to the market oil from the North sea are between \$40 and \$50, which bank will look sympathetically at a project when the price of oil is below that amount?

I also want to say something about the west of Shetland. We are working with Total and its partners regarding the Laggan and Tormore fields, which we believe will bring much needed gas infrastructure to the basin. We are working with the industry to improve its code of practice, and we are also working on our own guidelines. I was asked about discussions with neighbouring countries over their territories. I am aware of no ministerial discussions with the government of the Faroes but am assured that discussions on co-operation are ongoing at official level. If fields were found in the Faroes, we would certainly seek ways to co-operate to the benefit of both sides, but at present we have heard of no discoveries there.

Several Members praised the skills and innovation of the sector. What the industry is able to do is of global significance, and we all need to get behind it to maximise the jobs, investment and energy security we get from the sector. I paid tribute to the industry and to the courage of those who risk their lives for it, and we were reminded of the dangers of the work by the reference made to the tragic helicopter crash earlier this year and the many lives that were lost as a result. I spoke from my heart, expressing my appreciation of the industry, which we should be proud of, and the work that it does on behalf of this country. I am determined that we will perform to get the best out of the industry for our national interest.

PROGRESS OF LEGISLATION BEFORE PARLIAMENT

A comprehensive list of Public Bills before Parliament, giving up-to-date information on their progress through Parliament, is published regularly when Parliament is sitting in the Weekly Information Bulletin, which can be found at:

<http://www.publications.parliament.uk/pa/cm/cmweb.htm>

EURO-NEWS

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

Science in Europe: about Euroscience

What is Euroscience?

Euroscience was founded in 1997 by members of Europe's research community to:

- provide an open forum for debate on science and technology and research policies in Europe
- strengthen the links between science and society
- contribute to the creation of an integrated space for science and technology in Europe, linking research organisations and policies at national and EU levels; strive for a greater role of the EU in research
- influence science and technology policies
- Euroscience is a pan-European association of individuals interested in constructing scientific Europe "from the bottom-up"
- Euroscience represents European scientists of all disciplines (natural sciences, mathematics, medical sciences, engineering, social sciences, humanities and the arts), institutions of the public sector, universities, research institutes as well as the business and industry sector
- We are a grassroots organisation open to research professionals, science administrators, policy-makers, teachers, PhD students, post-docs, engineers, industrialists, and generally to any citizen interested in science and technology and its links with society
- We organise meetings of all sizes at the international level or at regional levels; publish position papers; and use the Internet to discuss science within a public agenda

EuroScience Jobs

- EuroScienceJobs is a recruitment medium for international science experts and international organisations doing scientific research in Europe
- EuroScienceJobs reaches specialised jobseekers:
- Every month EuroScienceJobs has 22,000 visits, and 15,000 unique visitors
- More than 10,000 Scientists are subscribed to our weekly newsletter
- All actively seeking research science jobs all over Europe
- Speakers of many European languages usually including English
- It is easy to submit job ads to EuroScienceJobs, and basic listings are usually free We have great options for quick hiring, multiple jobs and general public profiling for job ads - Formats, Prices, Audience etc

The office of Euroscience is located in Strasbourg, France.

1 quai Lezay Marnésia, F-67000 Strasbourg

Telephone: +33 (0)3 88 24 11 50

FAX: +33 (0)3 88 24 75 56

British company SSTL wins key role in Europe's Galileo programme

SSTL has been selected by ESA to supply 14 navigation payloads for the deployment phase of the Galileo satellite navigation system which was announced by the European Commission (EC) on 7th January. SSTL is teamed with OHB-System of Bremen, Germany for the provision of these fully operational Galileo satellites. The two companies agreed to work together as a 'core team' on Galileo at the end of 2007, with OHB taking the role of prime contractor and builder of the spacecraft 'bus' and SSTL taking full responsibility for the navigation payloads onboard the satellite that will form the heart of the Galileo navigation system.

Each satellite will carry two different types of highly accurate atomic clocks which are used to generate navigation messages that are broadcast by the satellites directly to the users' Galileo receivers. Under the contract, SSTL will be responsible for the design, manufacture and test of these navigation payloads using equipment procured mainly from European suppliers. SSTL will also manufacture some of the electronics to interface the satellite bus built by OHB-System and the navigation payload.

Commenting on the award SSTL Group CEO Dr Matt Perkins stated, "The award of this contract is an important step for SSTL. Our satellites are already providing operational services for many government and commercial customers and we are pleased to have a major role within Europe's flagship Galileo programme. The experience gained on GIOVE-A will help us to ensure the contract will be a success for the EC and ESA. This programme will also help to establish SSTL as a provider of communications and navigation satellites into other markets."

SSTL's Executive Chairman, Sir Martin Sweeting, added, "This award is great news for the UK space industry and once again confirms SSTL as a world leader in sophisticated satellites and payloads, building on its 25-year history pioneering small satellites with 34 already launched, truly changing the economics of space".

About Galileo

Galileo is a joint initiative of the European Commission (EC) and the European Space Agency (ESA). Galileo will be Europe's own global navigation satellite system, providing a highly accurate, guaranteed global positioning service under civilian control. It will be inter-operable with GPS and GLONASS, the two other global satellite navigation systems. A user will be able to take a position with the same receiver from any of the satellites in any combination. By offering dual frequencies as standard, however, Galileo will deliver real-time positioning accuracy down to the metre range, which is unprecedented for a publicly available system. It will guarantee availability of the service under all but the most extreme circumstances and will inform users within seconds of a failure of any satellite. This will make it suitable for applications where safety is crucial, such as running trains, guiding cars and landing aircraft.



SCIENCE DIRECTORY

DIRECTORY INDEX

Aerospace and Aviation

C-Tech Innovation
EPSRC
National Physical Laboratory

Agriculture

BBSRC
CABI
The Food and Environment Research Agency
LGC
Newcastle University
PHARMAQ Ltd
Society for General Microbiology
Society of Biology
UFAW

Animal Health and Welfare, Veterinary Research

ABPI
Academy of Medical Sciences
The Nutrition Society
PHARMAQ Ltd
Society of Applied Microbiology
Society of Biology
UFAW

Astronomy and Space Science

Natural History Museum
STFC

Atmospheric Sciences, Climate and Weather

Natural Environment Research Council
STFC

Biotechnology

BBSRC
Biochemical Society
CABI
C-Tech Innovation
Eli Lilly and Company Ltd
Institution of Chemical Engineers
LGC
National Physical Laboratory
Plymouth Marine Sciences
Partnership
Royal Society of Chemistry
Society for General Microbiology
Society of Applied Microbiology
Society of Biology

Brain Research

ABPI
Eli Lilly and Company Ltd
Merck Sharp & Dohme

Cancer Research

ABPI
Eli Lilly and Company Ltd
National Physical Laboratory

Catalysis

C-Tech Innovation
Institution of Chemical Engineers
Royal Society of Chemistry

Chemistry

C-Tech Innovation
Institution of Chemical Engineers
LGC

London Metropolitan Polymer Centre
Plymouth Marine Sciences
Partnership
Royal Institution
Royal Society of Chemistry
STFC

Colloid Science

London Metropolitan Polymer Centre
Royal Society of Chemistry

Construction and Building

Institution of Civil Engineers
London Metropolitan Polymer Centre
National Physical Laboratory

Cosmetic Science

Society of Cosmetic Scientists

Earth Sciences

The Linnean Society of London
Natural England
Natural Environment Research Council
Natural History Museum
Society of Biology

Ecology, Environment and Biodiversity

AMSI
The British Ecological Society
CABI
C-Tech Innovation
Economic and Social Research Council
The Food and Environment Research Agency
Institution of Chemical Engineers
Institution of Civil Engineers
Kew Gardens
LGC
The Linnean Society of London
National Physical Laboratory
Natural England
Natural Environment Research Council
Natural History Museum
Plymouth Marine Sciences
Partnership
Royal Society of Chemistry
Society for General Microbiology
Society of Applied Microbiology
Society of Biology

Economic and Social Research

Economic and Social Research Council

Education, Training and Skills

ABPI
Academy of Medical Sciences
Association for Science Education
AIRTO
British Science Association
The British Ecological Society
British Nutrition Foundation
British Pharmacological Society
British Society for Antimicrobial Chemotherapy
CABI
Clifton Scientific Trust
C-Tech Innovation

Economic and Social Research Council
EPSRC
Engineering UK
Institute of Measurement and Control
Institute of Physics
Institution of Chemical Engineers
Institution of Civil Engineers
Institution of Engineering and Technology
LGC
London Metropolitan Polymer Centre
NESTA
National Physical Laboratory
Natural History Museum
Plymouth Marine Sciences
Partnership
Royal Institution
The Royal Society
Royal Society of Chemistry
Royal Statistical Society
Society of Biology

Energy

CABI
C-Tech Innovation
EPSRC
Institute of Measurement and Control
Institute of Physics
Institution of Chemical Engineers
Institution of Civil Engineers
Institution of Engineering and Technology
Plymouth Marine Sciences
Partnership
Royal Society of Chemistry
STFC

Engineering

C-Tech Innovation
EPSRC
Engineering UK
Institute of Measurement and Control
Institution of Chemical Engineers
Institution of Civil Engineers
Institution of Engineering and Technology
London Metropolitan Polymer Centre
National Physical Laboratory
Plymouth Marine Sciences
Partnership
Royal Academy of Engineering
STFC

Fisheries Research

AMSI
Plymouth Marine Sciences
Partnership
Society of Biology

Food and Food Technology

British Nutrition Foundation
CABI
C-Tech Innovation
The Food and Environment Research Agency
Institution of Chemical Engineers
LGC
Newcastle University
The Nutrition Society
Royal Society of Chemistry
Society for General Microbiology

Society of Applied Microbiology
Society of Biology

Forensics

Institute of Measurement and Control
LGC
Royal Society of Chemistry

Genetics

ABPI
BBSRC
HFEA
LGC
Natural History Museum
Society of Biology

Geology and Geoscience

AMSI
Institution of Civil Engineers
Natural Environment Research Council

Hazard and Risk Mitigation

Health Protection Agency
Institute of Measurement and Control
Institution of Chemical Engineers

Health

ABPI
Academy of Medical Sciences
Biochemical Society
British Nutrition Foundation
British Pharmacological Society
British Society for Antimicrobial Chemotherapy
Economic and Social Research Council
Eli Lilly and Company Ltd
EPSRC
The Food and Environment Research Agency
Health Protection Agency
HFEA
Institute of Physics and Engineering in Medicine
LGC
Medical Research Council
National Physical Laboratory
The Nutrition Society
Royal Institution
Royal Society of Chemistry
Society for General Microbiology
Society of Applied Microbiology
Society of Biology

Heart Research

ABPI
Eli Lilly and Company Ltd

Hydrocarbons and Petroleum

Institution of Chemical Engineers
Natural History Museum
Royal Society of Chemistry

Industrial Policy and Research

AIRTO
Economic and Social Research Council
Institution of Civil Engineers
Royal Academy of Engineering
STFC



Information Services

AIRTO
CABI

IT, Internet, Telecommunications, Computing and Electronics

EPSRC
Institution of Civil Engineers
Institution of Engineering and Technology
National Physical Laboratory
STFC

Intellectual Property

ABPI
The Chartered Institute of Patent Attorneys
C-Tech Innovation
Eli Lilly and Company Ltd
NESTA

Large-Scale Research Facilities

C-Tech Innovation
The Food and Environment Research Agency
London Metropolitan Polymer Centre
National Physical Laboratory
Natural History Museum
STFC

Lasers

National Physical Laboratory
STFC

Manufacturing

ABPI
AMSI
EPSRC
Institution of Chemical Engineers
London Metropolitan Polymer Centre
National Physical Laboratory

Materials

C-Tech Innovation
Institution of Chemical Engineers
London Metropolitan Polymer Centre
National Physical Laboratory
Royal Society of Chemistry
STFC

Medical and Biomedical Research

ABPI
Academy of Medical Sciences
Biochemical Society
British Pharmacological Society
British Society for Antimicrobial Chemotherapy
CABI
Eli Lilly and Company Ltd
HFEA
Medical Research Council
Merck Sharp & Dohme
Plymouth Marine Sciences Partnership
Royal Institution
Society of Biology
UFAW

Motor Vehicles

London Metropolitan Polymer Centre

Oceanography

AMSI
National Physical Laboratory
Natural Environment Research Council
Plymouth Marine Sciences Partnership

Oil

C-Tech Innovation
Institution of Chemical Engineers
LGC

Particle Physics

STFC

Patents

The Chartered Institute of Patent Attorneys
NESTA

Pharmaceuticals

ABPI
British Pharmacological Society
British Society for Antimicrobial Chemotherapy
C-Tech Innovation
Eli Lilly and Company Ltd
Institution of Chemical Engineers
LGC
Merck Sharp & Dohme
PHARMAQ Ltd
Royal Society of Chemistry
Society of Biology

Physical Sciences

Cavendish Laboratory
C-Tech Innovation
EPSRC
London Metropolitan Polymer Centre
National Physical Laboratory

Physics

Cavendish Laboratory
C-Tech Innovation
Institute of Physics
National Physical Laboratory
STFC

Pollution and Waste

ABPI
AMSI
C-Tech Innovation
Institution of Chemical Engineers
Institution of Civil Engineers
London Metropolitan Polymer Centre
National Physical Laboratory
Natural Environment Research Council
Plymouth Marine Sciences Partnership

Psychology

British Psychological Society

Public Policy

The British Ecological Society
British Nutrition Foundation
British Society for Antimicrobial Chemotherapy
Economic and Social Research Council
Engineering UK
The Food and Environment Research Agency
HFEA
Institution of Civil Engineers
Institution of Chemical Engineers
NESTA
Prospect
Society of Biology

Public Understanding of Science

Academy of Medical Sciences
Biochemical Society
The British Ecological Society
British Nutrition Foundation
British Society for Antimicrobial Chemotherapy
Clifton Scientific Trust
EPSRC
Engineering UK
The Food and Environment Research Agency
HFEA

Institute of Physics
Institution of Chemical Engineers
Institution of Engineering and Technology
Medical Research Council
Natural History Museum
NESTA
Plymouth Marine Sciences Partnership
Prospect
Research Councils UK
Royal Academy of Engineering
Royal Institution
The Royal Society
Royal Society of Chemistry
STFC
Society of Biology

Quality Management

LGC
National Physical Laboratory

Radiation Hazards

Health Protection Agency
LGC

Retail

Marks and Spencer

Science Policy

ABPI
Academy of Medical Sciences
Biochemical Society
The British Ecological Society
British Nutrition Foundation
British Pharmacological Society
British Science Association
CABI
Clifton Scientific Trust
Economic and Social Research Council
Eli Lilly and Company Ltd
EPSRC
Engineering UK
The Food and Environment Research Agency
HFEA
Institute of Physics
Institution of Chemical Engineers
Institution of Civil Engineers
LGC
Medical Research Council
NESTA
National Physical Laboratory
Plymouth Marine Sciences Partnership
Prospect
Research Councils UK
Royal Academy of Engineering
Royal Institution
The Royal Society
Royal Society of Chemistry
STFC
Society of Biology
UFAW

Sensors and Transducers

AMSI
C-Tech Innovation
Institute of Measurement and Control
STFC

SSSIs

Kew Gardens
Natural England

Statistics

EPSRC
Engineering UK
Royal Statistical Society

Surface Science

C-Tech Innovation
STFC

Sustainability

The British Ecological Society
CABI
C-Tech Innovation
EPSRC
The Food and Environment Research Agency
Institution of Chemical Engineers
Institution of Civil Engineers
The Linnean Society of London
London Metropolitan Polymer Centre
Natural England
Plymouth Marine Sciences Partnership
Society of Biology

Technology Transfer

AIRTO
CABI
C-Tech Innovation
The Food and Environment Research Agency
Institute of Measurement and Control
LGC
London Metropolitan Polymer Centre
NESTA
National Physical Laboratory
Research Councils UK
Royal Society of Chemistry
STFC

Tropical Medicine

Health Protection Agency
Natural History Museum
Society for General Microbiology
Society of Applied Microbiology

Viruses

ABPI
Health Protection Agency
Society for General Microbiology
Society of Applied Microbiology

Water

AMSI
C-Tech Innovation
Institute of Measurement and Control
Institution of Chemical Engineers
Institution of Civil Engineers
LGC
Plymouth Marine Sciences Partnership
Royal Society of Chemistry
Society for General Microbiology
Society of Applied Microbiology
Society of Biology

Wildlife

The British Ecological Society
The Food and Environment Research Agency
The Linnean Society of London
Natural England
Natural History Museum
Society of Biology
UFAW



Research Councils UK

Contact: Alexandra Saxon
Head of Communications
Research Councils UK
Polaris House
North Star Avenue
Swindon SN2 1ET

Tel: 01793 444592
E-mail: communications@rcuk.ac.uk
Website: www.rcuk.ac.uk

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

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

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



Arts and Humanities Research Council



Arts & Humanities
Research Council

Contact: Jake Gilmore
Communications Manager
AHRC, Whitefriars, Lewins Mead, Bristol,
BS1 2AE
Tel: 0117 9876500
E-mail: enquiries@ahrc.ac.uk
Website: www.ahrc.ac.uk

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)



Contact: Dr Monica Winstanley
Head of External Relations
BBSRC, Polaris House, North Star Avenue
Swindon SN2 1UH. Tel: 01793 413204
E-mail: external.relations@bbsrc.ac.uk
Website: www.bbsrc.ac.uk

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



Contact: Lesley Lilley, Senior Policy
Manager, Knowledge Transfer,
Economic and Social Research Council,
Polaris House, North Star Avenue,
Swindon SN2 1UJ
Tel: 01793 413033
lesley.lilley@esrc.ac.uk
<http://www.esrc.ac.uk>

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

Contact: Jenny Aranha,
Public Affairs Manager,
EPSRC, Polaris House,
North Star Avenue, Swindon SN2 1ET
Tel: 01793 442892 Fax: 01793 444005
E-mail: jenny.aranha@epsrc.ac.uk
Website: www.epsrc.ac.uk

EPSRC is the main government agency for funding research and training in engineering and physical sciences, investing around £740 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



Contact: Sophie Broster-James
20 Park Crescent, London W1B 1AL.
Tel: 020 7636 5422 Fax: 020 7436 6179
E-mail: sophie.broster-james@headoffice.mrc.ac.uk
Website: www.mrc.ac.uk

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



Contact: Judy Parker
Head of Communications
Polaris House, North Star Avenue
Swindon SN2 1EU
Tel: 01793 411646 Fax: 01793 411510
E-mail: requests@nerc.ac.uk
Website: www.nerc.ac.uk

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, National Oceanography Centre and Proudman Oceanographic Laboratory

Science & Technology Facilities Council



Science & Technology
Facilities Council

Mark Foster
Public Affairs Manager
Rutherford Appleton Laboratory
Harwell Science & Innovation Campus
Didcot OX11 0QX
Tel: 01235 778328 Fax: 01235 445 808
E-mail: mark.foster@stfc.ac.uk
Website: www.stfc.ac.uk

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

Contact: Dr Helen Munn,
Executive Director
Academy of Medical Sciences
10 Carlton House Terrace
London SW1Y 5AH
Tel: 020 7969 5288
Fax: 020 7969 5298
E-mail: info@acmedsci.ac.uk
Website: www.acmedsci.ac.uk

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

Contact: Annette Smith
Chief Executive
Association for Science Education
College Lane Hatfield
Herts, AL10 9AA
Tel: 01707 283000
Fax: 01707 266532
E-mail: info@ase.org.uk
Website: www.ase.org.uk

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



Contact: Dr Allison Jaynes-Ellis
Medical & Innovation Director
12 Whitehall, London SW1A 2DY
Tel: 020 7747 1408
Fax: 020 7747 1417
E-mail: ajaynes-ellis@abpi.org.uk
Website: www.abpi.org.uk

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



Contact: Professor Richard Brook OBE FREng
AIRTO Ltd: Association of Independent
Research & Technology Organisations Limited
c/o Campden BRI, Station Road,
Chipping Campden,
Gloucestershire GL55 6LD.
Tel: 01386 842247
Fax: 01386 842010
E-mail: airto@campden.co.uk
Website: www.airto.co.uk

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



Contact: John Murray
Association of Marine Scientific Industries
28-29 Threadneedle Street,
London EC2R 8AY
Tel: 020 7628 2555 Fax: 020 7638 4376
E-mail: amsi@maritimeindustries.org
Website: www.maritimeindustries.org

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



Contact: Dr Chris Kirk
CEO
The Biochemical Society
Charles Darwin House
12 Roger Street
London WC1N 2JU
Tel: 020 7685 2433
Fax: 020 7685 2470

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



Contact: Sir Roland Jackson Bt,
Chief Executive
British Science Association,
Wellcome Wolfson Building, 165 Queen's Gate,
London SW7 5HD.
E-mail: Roland.Jackson@britishscienceassociation.org
Website: www.britishscienceassociation.org

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
Contact: Ceri Margerison, Policy Officer
British Ecological Society
Charles Darwin House, 12 Roger Street,
London, WC1N 2JU
Tel: 020 7685 2500 Fax : 020 7685 2501
Website: www.BritishEcologicalSociety.org
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



Contact: Professor Judy Buttriss,
Director General
52-54 High Holborn, London WC1V 6RQ
Tel: 020 7404 6504
Fax: 020 7404 6747
Email: postbox@nutrition.org.uk
Websites: www.nutrition.org.uk
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

Contact: Kate Baillie
Chief Executive
British Pharmacological Society
16 Angel Gate, City Road
London EC1V 2PT
Tel: 020 7417 0113
Fax: 020 7417 0114
Email: kb@bps.ac.uk
Website: www.bps.ac.uk

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



The
British
Psychological
Society

Contact: Dr Ana Padilla
Parliamentary Officer
The British Psychological Society
30 Tabernacle Street
London EC2A 4UE
Tel: 020 7330 0893
Fax: 020 7330 0896
Email: ana.padilla@bps.org.uk
Website: www.bps.org.uk

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

Mrs Tracey Guise
Executive Director
British Society for Antimicrobial Chemotherapy
Griffin House
53 Regent Place
Birmingham B1 3NJ
T: 0121 236 1988
W: www.bsac.org.uk

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

Contact: Dr Joan Kelley, Executive Director,
Global Operations, CABI
Bakeham Lane, Egham, Surrey TW20 9TY
Tel: 01491 829306 Fax: 01491 829100
Email: t.davis@cabi.org
Website: www.cabi.org

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

The Administrative Secretary, The Cavendish
Laboratory,
J J Thomson Avenue, Cambridge CB3 0HE, UK.
E-mail: dhp24@cam.ac.uk
http://www.phy.cam.ac.uk

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, neural 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



Contact: Michael Ralph -
Secretary & Registrar
The Chartered Institute of Patent Attorneys
95 Chancery Lane, London WC2A 1DT
Tel: 020 7405 9450
Fax: 020 7430 0471
E-mail: michael.ralph@cipa.org.uk
Website: www.cipa.org.uk

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

Contact: Dr Eric Albone
Clifton Scientific Trust
49 Northumberland Road, Bristol BS6 7BA
Tel: 0117 924 7664 Fax: 0117 924 7664
E-mail: eric.albone@clifton-scientific.org
Website: www.clifton-scientific.org

**Science for Citizenship and Employability,
Science for Life, Science for Real**

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

- for young people of all ages and abilities
- experiencing science as a creative, questioning, human activity
- bringing school science added meaning and motivation, from primary to post-16
- locally, nationally, internationally (currently between Britain and Japan)

Clifton Scientific Trust Ltd is registered charity 1086933

C-Tech Innovation Limited



C-Tech Innovation
...advantage through technology

Contact: Paul Radage
Capenhurst Technology Park,
Capenhurst, Chester, Cheshire CH1 6EH
Tel: +44 (0) 151 347 2900
Fax: +44 (0) 151 347 2901
E-mail: paul.radage@ctechinnovation.com
Website: www.ctechinnovation.com

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



Answers That Matter.

Contact: Thom Thorp, Head External Affairs
Tel: 01256 315000
Fax: 01256 775858
Eli Lilly and Company Ltd, Lilly House
Priestley Road, Basingstoke, Hants,
RG24 9NL
Email: thorp@lilly.com
Website: www.lilly.co.uk

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.





Contact: Gareth Lyon
Communications Executive
EngineeringUK
Weston House, 246 High Holborn
London WC1V 7EX
Tel: 020 3206 0445
Fax: 020 3206 0401
E-mail: glyon@engineeringuk.com

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



Contact: Dr R Angus Hearmon
Director of External Affairs
The Food and Environment Research Agency
Sand Hutton, York, YO41 1LZ
Tel: 01904 462284
Fax: 01904 462486
E-mail: angus.hearmon@fera.gsi.gov.uk
Website: www.defra.gov.uk/fera

The Food and Environment Research Agency's overarching 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



Contact: Justin McCracken, Chief Executive
Health Protection Agency Central Office
7th Floor, Holborn Gate, 330 High Holborn
London WC1V 7PP
Tel: 020 7759 2700/2701
Fax: 020 7759 2733
Email: webteam@hpa.org.uk
Web: www.hpa.org.uk

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



Contact: Peter Thompson
Director Strategy and Information
21 Bloomsbury St
London WC1B 3HF
Tel: 020 7291 8200
Fax: 020 7291 8201
Email: Peter.Thompson@hfea.gov.uk
Website: www.hfea.gov.uk

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



Contact: Mr Peter Martindale,
CEO and Secretary
The Institute of Measurement and Control
87 Gower Street, London WC1E 6AF
Tel: +44 (0) 20 73874949
Fax: +44 (0) 20 73888431
E-mail: ceo@instmc.org.uk
Website: www.instmc.org.uk
Reg Charity number: 269815

The Institute of Measurement and Control provides a forum for personal contact amongst practitioners, publishes learned papers and is a professional examining and qualifying organisation able to confer the titles Eurling, 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

Contact: Joseph Winters
76 Portland Place, London W1B 1NT
Tel: 020 7470 4815
E-mail: joseph.winters@iop.org
Website: www.iop.org

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.



Contact: Robert Neilson, General Secretary
Fairmount House, 230 Tadcaster Road,
York, YO24 1ES
Tel: 01904 610821 Fax: 01904 612279
E-mail: r.w.neilson@ipem.ac.uk
Website: www.ipem.ac.uk

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.



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.

Contact: Andrew Furlong, Director
t: +44 (0)1788 534484
f: +44 (0)1788 560833
e: afurlong@icheme.org
www.icheme.org

Institution of Civil Engineers



Contact: Vernon Hunte,
Senior Public Affairs Executive,
One Great George Street, Westminster,
London SW1P 3AA, UK
Tel: 020 7665 2265
Fax: 020 7222 0973
E-mail: vernon.hunte@ice.org.uk
Website: www.ice.org.uk

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



Contact: Paul Davies
IET,
Michael Faraday House,
Six Hills Way,
Stevenage,
SG1 2AY
Tel: +44 (0) 1438 313311
Email: policy@theiet.org
Web: www.theiet.org

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



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

Contact: Prof Simon J. Owens

Tel: 020 8332 5106

Fax: 020 8332 5109

Email: s.owens@kew.org

Website: www.kew.org

Two stunning gardens-devoted to building and sharing knowledge

LGC



Setting standards
in analytical science

Queens Road, Teddington

Middlesex, TW11 0LY

Tel: +44 (0)20 8943 7000

Fax: +44 (0)20 8943 2767

E-mail: info@lgc.co.uk

Website: www.lgc.co.uk

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

Contact: Dr Ruth Temple, Executive Secretary
Burlington House
Piccadilly
London W1J 0BF

Tel: 020 7434 4479

Fax: 020 7287 9364

E-mail: ruth@linnean.org

Website: www.linnean.org

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



Sir John Cass Department of Art, Media & Design

Contact: Alison Green,
London Metropolitan University
166-220 Holloway Road, London N7 8DB
Tel: 020 7133 2189

E-mail: alison@polymers.org.uk

Website: www.polymers.org.uk

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

Contact:

Paul Willgoss

Waterside House

35 North Wharf Road

London W2 1NW.

Tel: 020 8718 8247

E-mail: paul.willgoss@marks-and-spencer.com

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.



UK Subsidiary of Merck & Co., Inc

Contact: Margaret Beer/Rob Pinnock
Licensing & External Research, Europe
Hertford Road
Hoddesdon
Herts EN11 9BU
Tel: 01992 452837
Fax: 01992 441907
e-mail: margaret_beer@merck.com /
rob_pinnock@merck.com
www.merck.com

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



Contact: Madeleine Hallward
Head of Public Affairs

1 Plough Place

London EC4A 1DE

Tel: 020 7438 2615

Fax: 020 7438 2501

Email: Madeleine.Hallward@nesta.org.uk

Website: www.nesta.org.uk

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



National Physical Laboratory

Hampton Road, Teddington

Middlesex TW11 0LW

Tel: 020 8943 6880 Fax: 020 8614 1446

E-mail: enquiry@npl.co.uk

Website: www.npl.co.uk

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



Contact: Ken Roy
Director of Evidence
Natural England
John Dower House
Crescent Place
Cheltenham
GL50 3RA
Email: ken.roy@naturalengland.org.uk
Website: www.naturalengland.org.uk

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



Contact: Joe Baker
Special Adviser to the Director
Natural History Museum
Cromwell Road
London SW7 5BD
Tel: +44 (0)20 7942 5478
Fax: +44 (0)20 7942 5075
E-mail: joe.baker@nhm.ac.uk
Website: www.nhm.ac.uk

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



Contact: Frederick Wentworth-Bowyer,
Chief Executive, The Nutrition Society,
10 Cambridge Court, 210 Shepherds Bush Road
London W6 7NJ
Tel: +44 (0)20 7602 0228
Fax: +44 (0)20 7602 1756
Email: f.wentworth-bowyer@nutsoc.org.uk

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

PHARMAQ Ltd

Contact: Dr Lydia A Brown
PHARMAQ Ltd
Unit 15 Sandleheath Industrial Estate,
Fordingbridge
Hants SP6 1PA.
Tel: 01425 656081
Fax: 01425 655309
E-mail: lydia.brown@pharmaq.no
Website: www.pharmaq.co.uk/shop

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



Plymouth Marine Sciences Partnership

Contact: Rosie Carr
The Laboratory, Citadel Hill
Plymouth PL1 2PB
Tel: +44 (0)1752 633 234
Fax: +44 (0)1752 633 102
E-mail: forinfo@pmsp.org.uk
Website: www.pmsp.org.uk

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



Contact: Sue Ferns,
Prospect Head of Research and Specialist Services, New Prospect House
8 Leake St, London SE1 7NN
Tel: 020 7902 6639 Fax: 020 7902 6637
E-mail: sue.ferns@prospect.org.uk
www.prospect.org.uk

Prospect is an independent, thriving and forward-looking trade union with 124,000 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

Contact: Philip Greenish CBE,
Chief Executive
3 Carlton House Terrace
London SW1Y 5DG
Tel: 020 7766 0600
E-mail: philip.greenish@raeng.org.uk
Website: www.raeng.org.uk

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



Contact: Dr Gail Cardew
Head of Programmes
The Royal Institution
21 Albemarle Street, London W1S 4BS
Tel: 020 7409 2992 Fax: 020 7670 2920
E-mail: gail@ri.ac.uk Website: 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



CELEBRATING 350 YEARS

Contact: Dr Peter Cotgreave
Director of Public Affairs
The Royal Society, 6-9 Carlton House Terrace
London SW1Y 5AG.
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.



RSC | Advancing the Chemical Sciences The Royal Society of Chemistry

Contact: Dr Stephen Benn
Parliamentary Affairs
The Royal Society of Chemistry
Burlington House, Piccadilly, London W1J 0BA
Tel: 020 7437 8656 Fax: 020 7734 1227
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



Contact: Mr Andrew Garratt
Press and Public Affairs Officer
The Royal Statistical Society
12 Errol Street, London EC1Y 8LX.
Tel: +44 20 7614 3920
Fax: +44 20 7614 3905
E-mail: a.garratt@rss.org.uk
Website: www.rss.org.uk

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.

Society for Applied Microbiology



Contact: Philip Wheat
Society for Applied Microbiology
Bedford Heights, Brickhill Drive
Bedford MK41 7PH
Tel: 01234 326661
Fax: 01234 326678
E-mail: pfwheat@sfam.org.uk
Website: www.sfam.org.uk

SfAM 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.

SfAM 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: Janet Hurst
Marlborough House, Basingstoke Road,
Spencers Wood, Reading RG7 1AG.
Tel: 0118 988 1809 Fax: 0118 988 5656
E-mail: pa@sgm.ac.uk
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
9, Red Lion Court,
London EC4A 3EF
Tel: 020 7936 5900
E-mail: markdowns@societyofbiology.org
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

SOCIETY OF
COSMETIC
SCIENTISTS



Contact: Lorna Weston,
Secretary General
Society of Cosmetic Scientists
Langham House East
Suite 6, Mill Street, Luton LU1 2NA
Tel: 01582 726661
Fax: 01582 405217
E-mail: ifscs.scs@btconnect.com
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,
Scientific Director
The Old School, Brewhouse Hill
Wheathampstead, Herts. AL4 8AN.
Tel: 01582 831818. Fax: 01582 831414.
Email: ufaw@ufaw.org.uk
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.



SCIENCE DIARY

THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE

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

Monday 8th March 12.30-20.30

SET for BRITAIN

Poster Competition and Exhibition for early-stage researchers

12.30-14.30 Physical Sciences (Chemistry and Physics)

15.30-17.30 Engineering

18.30-20.30 Biological and Biomedical Sciences

Thursday 18th March

National Science and Engineering Week Seminar

What is Seamless Weather Forecasting – How can we forecast years ahead and manage the global financial risks profitably?

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

Tuesday 16 February 19.00-20.30pm
The music instinct

Wednesday 17 February 19.00pm-20.30
Maths education – does it add up?

Monday 22 February 19.00-20.30
Smart drugs

Monday 8 March, 19.00-20.30

Little minds, big ideas

Tuesday 16 March 19.00-20.30

The Eerie Silence: Are we alone in the universe?

Friday 19 March 19.00-20.30

The miraculous disaster of immortality

Wednesday 31 March 19.00-20.30
Laughlab

Wednesday 21 April 19.00 start

The science of scent

This event supported by P&G PRESTIGE PRODUCTS

Thursday 6 May 19.00 start

Flavour - the mystery sense

Thursday 6 May 19.00 start

Bragg Lecture: Highlights of journeys into the architecture of the invisible

Tuesday 11 May

Food allergies - what is there to worry about?

THE ROYAL SOCIETY

Throughout 2010 the Royal Society is celebrating its 350th anniversary in a yearlong 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.

Highlights in the next few months include:

Monday 15 March 18.30

Ferrier lecture Plasticity of the brain: the key to human development, cognition and evolution

Professor Colin Blakemore FRS
Royal Society

Saturday 20 March (all day)

Rising to the climate challenge: artists and scientists imagine tomorrow's world

Capital Science at Tate Modern

Monday 19 and Tuesday 20 (all day)

Biological diversity in a changing world

Royal Society

Saturday 16 May 14.00

Dr Jenners garden party

Local Heroes at the Edward Jenner Museum, Gloucestershire

All Royal Society lectures are available from the Royal Society website. The collection includes over 200 lectures with speakers including David Attenborough, Ottoline Leyser and James Lovelock. Details of all of these plus our forthcoming events programme can be found at royalsociety.org

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

Tuesday 13 April 18.00 for 18.30

The 2010 Lloyd's Register Educational Trust Lecture and Dinner

A low carbon world - is it realistic?

Dr Anne-Marie Warris, Environmental Adviser, Lloyd's Register
Chair: Lord Browne of Madingley FREng FRS
Royal Society of Medicine, 1 Wimpole Street, London, W1G

For further details contact:

Faye.whitnall@raeng.org.uk

THE ROYAL SOCIETY OF CHEMISTRY

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

BRITISH SCIENCE ASSOCIATION

Please visit

www.britishsociety.org for events programme.

ROYAL PHARMACEUTICAL SOCIETY OF GREAT BRITAIN

Contact: events@rpsgb.org

www.rpsgb.org/events

Monday 22 – Wednesday 24 February Stability testing of pharmaceuticals

A three day residential course organised by the RPSGB, in partnership with the Academy of Pharmaceutical sciences
Held at the Moller Centre, Cambridge

Wednesday 24 March Future directions in pharmacy education

A one day conference organised by the RPSGB, in partnership with the Academy of Pharmaceutical sciences
Held at the University of Reading

Sunday 16 – Thursday 20 May The twelfth advanced level workshop on Pharmacokinetic - Pharmacodynamic data analysis: A hands-on residential course using WinNonlin

In partnership with the Swedish Academy of Pharmaceutical Sciences
Held at Madingley Hall, Cambridge

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 11 March 09.30-16.00 and 18.00-19.15

The commercial exploitation of Thames Chinese mitten crabs. Damned if we don't – damned if we do.

Joint meeting between the Linnean Society of London and the Natural History Museum and supported by The London Port Authority, City of London Corporation.

Registration £30; booking form available from www.linnean.org.

Thursday 18 March 18.00-20.30 Siphonophores: tangled tentacles or ocean predators?

Gill Mapstone FLS

Tuesday 20 – Thursday 22 April Early Events in Monocot Evolution

Joint meeting between the Linnean Society of London and Royal Botanic Gardens, Kew and supported by The Systematics Association and Annals of Botany.

Registration £75; booking form available from www.linnean.org.

Three-day conference, held at the Linnean Society of London & Royal Botanic Gardens, Kew

ENGINEERING PROFESSORS' COUNCIL

Monday 12 – Wednesday 14 April The Engineering Professors' Council's 2010 Congress

The Congress will be held at Loughborough University.

For further information and booking details, go to

<http://www.epc.ac.uk/current/diary/story.php?id=118>.



OFFICERS OF THE PARLIAMENTARY & SCIENTIFIC COMMITTEE

President:	The Rt Hon Lord Jenkin of Roding
Chairman:	Mr Ian Taylor MBE MP
Deputy Chairmen:	Mr Andrew Miller MP Dr Evan Harris MP
Hon Treasurer and Hon Secretary:	Mr Robert Goodwill MP
Vice-Presidents:	Dr Brian Iddon MP Dr David Dent Professor Peter Saunders Mr Robert Freer Professor Julia King CBE FREng Dr Douglas Naysmith MP Dr Desmond Turner MP Mr Robert Key MP Professor Alan Malcolm Mr Paul Ridout Dr Robert Kirby-Harris Mr Philip Greenish CBE
Advisory Panel:	



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

Editorial/Management Board:
Dr Brian Iddon MP (Chairman)
Mr Robert Freer
Dr Ashok Kumar MP
Professor Alan Malcolm
Mr Andrew Miller MP
Dr Douglas Naysmith MP
The Lord Soulsby of Swaffham Prior

Published by the Parliamentary and Scientific Committee, 3 Birdcage Walk, London SW1H 9JJ.

Published four times a year. The 2010 subscription rate is £70.00. Single numbers £17.50

ISSN 0263-6271

All enquiries, including those from members wishing to take the front or back covers, advertise in the journal or appear in the directory to Mrs Annabel Lloyd, Tel 020 7222 7085

Copyright ©2010 by Parliamentary and Scientific Committee. All rights reserved. None of the articles in this publication may be reproduced, stored in a retrieval system or transmitted in any form, or by any means, electronic, mechanical, photocopying recording or otherwise without the prior written permission of the copyright owner.

Typeset and printed by The Bridge Press.



AMPS

**The Association of
Management and
Professional Staffs.**



Who is looking after your interests at work?



The Association of Management and Professional Staffs is a UK Registered Trade Union whose origins go back to the British Association of Chemists founded in 1918.

Its original membership of graduate scientists in the UK chemical industry has since widened to include managers, scientists and other graduate level staff in a range of science based UK industries. These include chemicals, pharmaceuticals, textiles, and there is also a special section for professional divers.

AMPS is a branch of Unite the Union with our Head Office in the North West Region, and is self governing, with its own agreements and is fully autonomous in all industrial relations activities.

AMPS is a non politically aligned association whose main aim is the enhancement and protection of its members' terms and conditions. The Association aims to minimise confrontation within industrial relations by encouraging use of independent arbitration when serious disputes arise. We believe that the interests of our members are best served through consultation and negotiation.

The Association is fully committed to equality and fairness for all and are committed to looking after our members whatever their role.

For further information, take a look at and register your interest on our website at www.amps-tradeunion.com
Alternatively write to us:

AMPS, Unite the Union, Parkgates, Bury New Road, Prestwich, Manchester, M25 0JW
Or call 0161 798 8976