Summer 2008

SCIENCE IN PARLIAMENT

Engineering Skills

Hands-on Science

Chemicals in Food, Water and Consumer Products

Biosimilar Medicines

SCIENCE IN PARLIAMENT

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

The Parliamentary and Scientific Committee

Dr John Snow died on 16 June 1858, and I had the pleasure to visit the John Snow public house in Soho on the morning of 16 June, when the Royal Society of Chemistry invited a 'flurry' of Snows to attend the unveiling of a 'blue plaque' by the Rt Hon Alan Johnson, Secretary of State for Health, to commemorate his work. For those who are unfamiliar with Snow's work Dr Stanwell-Smith reminds us of its importance in this edition of SiP. The John Snow Society believes that his work is of equal importance to that of engineer Joseph Bazalgette, who was instructed by Parliament in 1858 to stop raw sewage flowing into the River Thames, which created the 'Great Stink' of that year. The smell of the river was so bad that Parliament considered moving to Hampton Court Palace.

Worryingly, our pharmaceuticals industry has lost more than 8,000 jobs in the last three years, according to recent figures released by the ABPI. "The pharmaceutical industry has lost confidence in the country as a place to do business", a new survey by the ABPI and CBI of 100 UK-based pharmaceutical companies has revealed. 35 companies are expecting to reduce their level of R&D investment over the next 12 months, currently worth £4 billion, the level of manufacturing is forecast to drop in 42 of the companies, and 46 of them are expected to reduce the number of clinical trials. Our Government should be concerned by these trends.

Recent experience with the Energy Bill and the DIUS Select Committee, which has just published ***Renewable electricity-generating technologies***, has convinced me that the biggest barrier to renewable energy is access to the transmission grid. Unless owners of the grid can sort out these access problems shortly, there will be fresh calls for its nationalisation.

The P&SC has opened a discussion forum on its website, www.scienceinparliament.org.uk, and we invite members to give their views on current controversies. For example, it has been proposed (not by Government) that teaching in FE and HE be administered by a single funding council. Would this lead to a single salary scale for academic staff and grants for all students, whether in FE or HE? What changes would it bring to our universities? What do you think?

Dr Brian Iddon MP
Chairman, Editorial Board
Science in Parliament

Contents

Summer 2008 Volume 65 Number 3

ISSN 0263-6271

Science in the NHS

Ann Keen MP
Parliamentary Under-Secretary of State, Department of Health

This year we celebrate the 60th anniversary of the National Health Service. In marking this momentous milestone, it is crucial that we acknowledge the important role science has played in driving forward crucial innovation and improvements, leading to better patient care for many and saving millions of lives.

The last sixty years have seen astonishing advances in diagnosis, treatment and care within the NHS. IVF, MRI and PET scans are just some of the advances powering innovation, providing evidence for change and ensuring that laboratory research is quickly translated into better and more effective care for patients.

In 1948, just a few hundred healthcare scientists were employed within the service. They were found behind the scenes, typically in pathology laboratories. Today, there are over 50,000 healthcare scientists working for the NHS and its related bodies such as the Health Protection Agency. They make up the single largest science workforce in Britain (and the third largest in Europe). The size of this workforce – which is a surprise to many – reflects the critical cross cutting importance of scientific services in patient care, with eight out of ten clinical decisions now depending on diagnostic information. They have been important innovators in health and have played a key role in ensuring that the many scientific advances of the last sixty years have been translated into opportunities for better care for patients. As a former nurse of more than 25 years' experience in the NHS, I have witnessed many of these advances.

For example, NHS medical physicists pioneered and developed many of the dazzling new imaging technologies which have revolutionised the diagnosis and management of disease. X rays have become safer for both patients and medical staff, with clearer images produced using a lower radiation dose. Ultrasound, developed within the NHS, no longer produces fuzzy pictures, but highly detailed 3D images which are used in cardiology, fetal medicine and many other areas. A whole new field, functional imaging, uses gamma and Postiron emission tomography (PET) cameras to track injected radioisotopes. Functional MRI scans show soft tissues in high definition along with brain physiology. This ability to reveal the brain at work has sparked an unprecedented era of discovery in neuroscience.

As science in the wider world advanced, so did science in the NHS. Watson & Crick's 1953 paper on DNA marked the beginning of an explosion of genetic knowledge and soon the NHS began employing geneticists to interpret the new knowledge about genes for patient benefit. As assisted reproductive technologies like in-vitro fertilisation (IVF) were developed, another new profession emerged – clinical embryologists – dedicated to ensuring that the highest quality standards are translated into the best chances of pregnancy for infertile couples.

Clinical engineering in the NHS meanwhile has quietly revolutionised rehabilitation, beginning with the design, manufacture and maintenance of improved artificial limbs, wheelchairs and other mobility aids. Developments in technology, including composite materials, electronics and computing have improved prosthetics which can now be controlled by stimulation from the central nervous system. Such systems are able to activate nerves affected by paralysis.

Measuring how effectively body systems are working is another key area. In 1948, patients had their breathing assessed by blowing into laboratory based water spirometers, a far cry from the hand-held devices used in GP practices today with embedded micro chips which can transmit data to offsite locations for reporting and interpreting, for monitoring changes in a patient's condition and for quality assurance purposes, important in national and global clinical trials. Much of this development in device technology has been done in a symbiotic partnership between NHS scientific departments and industry. The advance in technology has also allowed respiratory function to be assessed both awake and asleep. When this became possible, new diseases were revealed such as sleep apnoea which was virtually unknown in 1948.

Diagnosis is today moving out of the laboratory and into the GP's surgery and patient's home. 'Labs on a chip', developed and refined by scientists within the NHS, measure multiple substances simultaneously from a single drop of blood.

The NHS, with its unique structure, has always been at the forefront of health innovation. Over the past decade, the Government has more than doubled science spending, a large proportion of which has driven research with application in public health and healthcare. Investment in healthcare research through the Medical Research Council and the National Institute for Health Research (NIHR) has already made a difference for patients. When the NHS began, blindness was inevitable for those with inherited eye disease. One of the new NIHR funded specialist biomedical research centres is a collaboration between Moorfield's Eye Hospital and University College London. Gene therapy developed at the centre has already improved the sight of some young people with rare blinding conditions; further work with stem cell therapy and new medicines which prevent scarring in the eye show enormous promise for a range of other eye problems.

Science is also at the heart of public health policy within the Department of Health, informing it and providing the

evidence for response in the face of new threats to public health and safety. A current example is in the development of guidance and plans to support the NHS in its preparations for a flu pandemic. The DH Health Scientific Advisory Group completed comprehensive reviews of evidence supporting the use of clinical countermeasures, publishing them in 2007.

Many of the innovations that improve the lives of Britons during the next sixty years are as yet unimagined. Much more certain is the knowledge that science – and scientists – will continue to be the bedrock of the NHS – as they have been for the past sixty years.

Science in Universities

Diana Warwick

Chief Executive, Universities UK

It is well known but worth repeating that the UK produces nine per cent of the world's scientific papers with a citation share of 12 per cent, second only to the US, and has continued to strengthen its share of the world's most influential papers. The UK's universities have underpinned this success, which has been achieved with relatively lower investment than competitors. The continued strength of research in the UK's universities is present across the sector in a full range of disciplines from engineering and physical sciences through to the arts and humanities.

Universities' research performance is closely linked to our country's future economic and social prosperity, with science and innovation rising up the list of priorities for political attention and public investment. For their part, the current Government has demonstrated political commitment through the substantial investment that has flowed from the 10-year Science and Innovation Investment Framework. Parties from across the political spectrum have recognised its importance. This is good news.

Much of the recent additional investment in university research has gone to sustain the research base. Termed 'full economic costing', the basic principle has been to sustain the volume of project-based research funding through the Research Councils, but to ensure that more of the costs are covered to allow universities to re-invest in their infrastructure. To some this might seem a mere accounting issue, but it has been fundamental in helping to turn around years of under-investment and set UK universities on a firm footing to take on the biggest challenges, with labs and facilities that are world class and fit for purpose.

The success of the UK's Higher Education Institutions (HEI) research has also been underpinned by another seemingly arcane, but nonetheless essential, policy – the dual support system. This provides public funds to institutions in two streams, one as part of their block grant provided by the devolved funding councils (known as 'quality related' or QR), and the other in the form of project-based grants provided by the UK-wide Research Councils. A key strength of this system is that the QR grant is unhypothecated – that is not restricted to a specific purpose – allowing university leaders the freedom to take strategic decisions about the research activities of their own institutions. This means that risky or more innovative research can be supported, when it might otherwise slip though the net.

Universities UK's 2006 publication, *Eureka UK*, outlined some of the most outstanding world-changing discoveries, innovations and research projects that have come out of UK universities over the past 50 years. Many of these developed from individuals or groups supported through QR funds. They were given time to evolve in supportive research cultures. Put simply, if UK universities are going to be able to continue to punch above their weight in an increasingly competitive international environment, they need the flex and dynamism that dual support affords them.

A sustainable and dynamic university system will mean that we can also improve the attractiveness of the UK to inward investors and potential partners, draw the best mobile talent, and capitalise on international collaborations. New knowledge can arise anywhere and international research collaboration is a direct means of accessing it and increasing the UK's strategic capability for innovation. A recent report by Universities UK shows that we are already doing well. UK researchers are hugely active in international collaborations and their number is 50% higher than 10 years ago. We cannot, however, be complacent. China, India and South Korea are now significant players in global science and innovation networks that channel flows of people, ideas and technologies.

Research in UK universities is not only strong internationally, but also relevant to business and public sector users at regional and national levels. Strength in this area comes from the diversity of the sector and universities have worked extremely hard to ensure that we do not miss opportunities to exchange knowledge that has the potential to underpin the development of innovative products and services that can benefit us all. The commitment to a permanent source of funding to help make this happen, through the Higher Education

Innovation Fund (HEIF), has been successful in stimulating knowledge exchange, business links and other forms of employer engagement such as continuing professional education.

There is little doubt that research in our universities underpins science and innovation. The challenge going forward will be to sustain the momentum of recent years and further strengthen our universities, in all their diversity. This will require ongoing political commitment. For their part the universities are committed to excel in all that they do and play a leading role in meeting the needs and challenges of the UK in the 21st century.

Diana Warwick (Baroness Warwick of Undercliffe) has been a Member of the House of Lords since 1999 and Chief Executive of Universities UK since 1995.

Engineering Skills: Investing in Tomorrow

Dr David Brown

Chief Executive, Institution of Chemical Engineers (IChemE)

For the past year or more, something of a wind of change has been blowing through the once-dusty corridors of the UK's engineering profession. Under a new generation of management, the professional institutions, once jealous of their independence and separation, have now come to work together – joining forces on a number of issues of common concern and common importance.

Uppermost among those issues is securing the 'talent pipeline' which underpins the current and future success of much of UK industry and provides a powerful magnet for exactly the kind of knowledge-based inward investment that Government has rightly made a priority.

Chemical Engineers are supposed to know about pipelines, and we in IChemE – The Institution of Chemical Engineers – have taken a lead in addressing this particular pipeline. In doing so we are building on a successful foundation: the 'WhyNotChemEng' campaign to promote chemical, biochemical and process engineering to young people has helped to increase application rates to universities by over 70% over a five-year period. Now, we have joined with the other engineering institutions under the auspices of the 'G15' group of Chief Executives, to develop a common understanding of the challenges at the 'upstream' end of the talent pipeline – the supply of young people trained in the science, technology, engineering and mathematics subjects – the STEM disciplines. Together, we have called for action on four specific topics.

Firstly, it's time that policy makers explicitly recognised that young people at secondary school should be taught STEM subjects by staff thoroughly trained and well-versed in the subjects that they are teaching – so physics is taught by a physicist, chemistry by chemists and so on. That of course means improved incentives to attract talented people into STEM subject teaching, including both financial incentives and other levers such as first-rate laboratories and physical resources, provision for continuing professional development and so on.

Secondly, we have called for increased incentives for young people not simply to take STEM subjects at university but subsequently to enter relevant careers. We have proposed that this could be achieved by a progressive write-off of student debt for those young people who enter appropriate industrial careers or indeed choose, ideally after a period of industrial experience, to move into teaching themselves. We are not averse to some graduates also going into general management and financial careers, since their skills are immensely valuable there and businesses by and large are likely to be better run with more engineering and technical understanding in the board room and through the management structure. But it's a supply of skill to technology-based industry and to education that most concerns us.

Thirdly, it is time for solid benchmark standards for careers support. If someone purporting to give you financial advice has to meet recognised standards that are properly enforced, how much more important is it that reliable standards of advice should also be available where advice concerns young people's careers?

Fourthly, and perhaps longest-term, we believe there should be a science 'spearhead' in every substantial primary school. Science co-ordinators are of course already in place, but they are not always science or engineering graduates, and we believe they should be. It's gratifying to see this latter proposal supported by the recent Conservative party policy paper on Innovation in the UK.

Meeting these requirements will not be cheap, nor will it be easily or quickly achieved. But the consequences of failure to invest in STEM education are, we submit, far more costly – and there is already evidence from research for UK Trade and Investment that the UK is losing ground in this vital area.+

+ Perceptions of the UK as a Science and Technology Partner, report by consultants Arthur D Little Ltd for UK TI, 2006

Science and Society: Realising the Vision

Ian Pearson MP
Minister of State, Department of Innovation, Universities and Skills

We have a vision. A vision for a better relationship between science and society in this country. A vision for a society that is excited by science, values its importance to our social and economic well-being, feels confident in its use, and supports a representative, well-qualified scientific workforce.

Throughout our first year, I and other DIUS Ministers have been exploring this vision with many different groups and individuals.

Science improves the quality of daily life, underpins prosperity and increases our readiness to face the challenges of the future – both in the UK and overseas. There has never been a time when the UK population has been bigger consumers of the products and benefits of science and technology, or that the future economic success of the UK has been more dependent on successful exploitation of science and technology and our ability to become an Innovation Nation.

There is great potential for science to contribute to good policy-making and sound government. Science can help us to address the main challenges we face as a nation and as a planet: adapting to climate change; global security and international terrorism; rising populations and the consequent pressure on food, water and other natural resources; the impact of human diseases such as pandemic influenza and animal diseases such as foot and mouth and blue tongue.

The need for consultation

I believe there is a strong leadership role to be played by Government, in addressing these challenges. But to ensure we all make the right decisions, now and in the future, we want to develop a shared strategy that is not only the responsibility of Government, but all groups which impact on the relationship between science and society. We have therefore just published a consultation document to help us develop that strategy.

This consultation aims to build on past policy and success but also recognises that the changing pace of scientific discovery and the changing environment in which science is viewed by society raises new challenges and questions for us all. It focuses in particular on what more we need to do in public engagement; improving public confidence in science and developing a workforce to achieve this common vision.

Our ambition is to build a more mature relationship between the public (including the media and education), policy makers and the science community (including business) so that each understands the others' objectives, ways of achieving them, aspirations and concerns.

The Challenges

Each chapter of our consultation sets out a goal, describes the current situation, and then poses a number of questions that relate to the key challenges in the vision. The first goal is to achieve a society that is excited about science and values its importance to our social and economic wellbeing.

We believe increasing excitement in science, improving inclusion and strengthening the relevance of science in our culture will be best achieved by professionalising public engagement and identifying ways to recognise the benefits it brings. The consultation identifies key areas for action as strengthening communication, especially two-way, improving access and participation, and doing more to demonstrate relevance.

The second chapter focuses on helping to create a society that is confident in the use of science.

In March, the DIUS/RCUK Public Attitudes to Science Survey 2008 was published. It showed that public trust in scientists continues to be strongly influenced by the scientists' experience, academic credentials and, crucially, their perceived independence from government and big business. It also indicated a demand for more consultation on scientific issues before decisions are made. The consultation therefore identifies four key areas for action to help create a better understanding of the nature of science, to build confidence in science funded by the private sector, to do more listening to what people say and to develop a better understanding of the role of science in policy making.

The final part of the vision sets out our goal for a society that supports a representative well-qualified scientific workforce.

For the UK to remain at the forefront of scientific discovery and to secure the UK's future in a highly competitive global economy, we need to ensure the next generation of scientists and engineers are properly equipped through opportunities in education, research, commerce and government. Unlocking the talent of Britain's citizens through increasing their ability to acquire and develop their own skills is critical both individually and at a societal level. As the Leitch Review of Skills outlined in 2006, the only way to compete on the world stage is to increase the coverage of higher levels of skills in our workforce. Through the consultation, we want to explore three areas for action, linking how to excite people about science to developing skills for life, increasing clarity in the benefits of scientific skills in all careers and increasing the diversity of the workforce.

Call to Action

Over the next few months we aim to

engage with all sectors of society, the science community and policy-makers to address the questions in the consultation document.

We are trialling a number of new ways to run this consultation in order to reach as many people as possible. The consultation has a strong on-line focus as a gateway to other ways to take part. http://interactive.dius.gov.uk/scienceandsociety

I believe that Science in Parliament's audience has a key role to play in the success of this strategy and I encourage you to participate in the consultation and development of the final strategy and implementation plan.

OPINION

Science in Parliament

The Rt Hon Lord Jenkin of Roding
President of the Parliamentary and Scientific Committee

It has always surprised people when I have to admit that I did almost no science at school. We had evening biology lectures by a brilliant retired teacher who put marvellous pictures on the screen with an epidiascope – but this was extracurricular and happily did not involve examinations. That was where I first learned about sperm whales, penguins, chimpanzees and even the duck-billed platypus. I am not aware of having learned any physics or chemistry at school. I did Latin and Greek, ancient history, French, and some maths (indeed I have on my bookshelves a maths prize). At university, it was the same – classics and law. – but no science.

This came sharply home to me when, after a brief and undistinguished career at the Bar, I got a job in the chemical industry. On my first day, I was asked if I knew what was meant by 'organic chemistry' – and had to confess that I did not. So I was given a school textbook to read on organic chemistry – my first encounter with the world of molecules and atoms, chemical compounds and suchlike. At the end of my first week in the office which I shared with a chemistry PhD who looked after process licensing for the company, I wondered aloud how I could ever be of any use to my employers! Yet, I stayed with them for 13 years, so perhaps I must have been.

However, when I expressed an interest in standing for Parliament – Oh dear! I was almost sacked on the spot! It was only when they began to complain that no-one in the House of Commons seemed to understand industry, and I replied that if they named a company I could tell them an MP it had sacked, that they began to get the message!

There may not be a lot of MPs today who have had as little scientific education as I had 70 years ago, but, equally, there are not a lot of trained scientists or engineers who find their way into Parliament. It is my impression that, with some notable exceptions, we are still a pretty unscientific lot!

Before I was elected in 1964, I had heard about the Parliamentary and Scientific Committee, and had been advised by a friend to join – it was my first All-Party Group – indeed, I learned later that it was the first All-Party Group. I have never regretted this decision. It has always seemed to me to be a valuable bridge between the worlds of science and technology and the world of politics. Over the years, the benefit of hearing, month after month, eminent scientists, engineers and academics discussing the issues of the day as they affected their businesses, professions and research has been incalculable. Often, the topics chosen have directly borne on controversies relevant to legislation coming before Parliament – I need only instance the recent legislation on human fertilisation and embryology to make this point. Under successive Chairmen, and with the help of successive experts to advise them, the P & Sci has attracted speakers and audiences of real distinction whose wisdom has had a real influence on our debates, both in the Commons and in the Lords. Conversely, the influence can go the other way – as for instance on the issue of the public engagement in science, or on other subjects investigated by our S & T Select Committees.

When I say 'audiences', it is necessary to point out that these days most of those attending our meetings are not Parliamentarians but represent outside organisations. These men and women are certainly very welcome and add much of value to our discussions; but I am not alone in regretting that we do not attract more MPs and Peers to come to the meetings. With science impinging on so many of the concerns that we have to deal with, week in week out, I think that more of my Parliamentary colleagues, *of all Parties*, would find the hour-and-a-half spent once a month time very well spent in helping them to find solutions to those concerns. Climate change, energy conservation, food standards, industrial innovation, as well as the teaching of science in our schools, research in our universities, and the ever-accelerating pace of scientific discovery, are all issues that regularly come up at Question Time or in Select Committee Inquiries. They are also all issues that have regularly featured in the programme of the P & Sci.

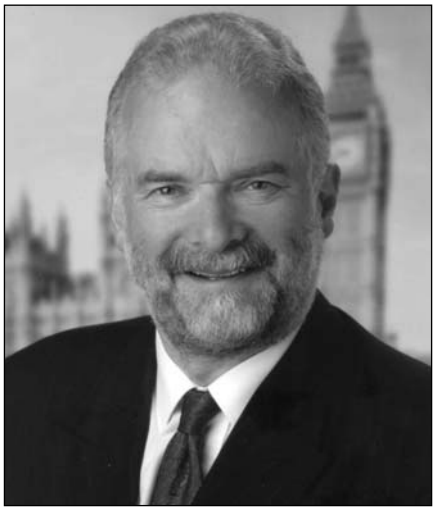
Newspaper articles, TV and radio programmes, the internet and even specialist All-Party Groups are of course useful sources of information and advice on which we all rely to make ourselves better informed. But

they need to be accompanied by the chance of listening to real experts with a variety of experience and different opinions and of cross-examining them. These are the opportunities offered regularly by the P & Sci. Happily, today there are very few of my colleagues in both Houses who arrive with as little scientific expertise as I had 44 years ago – but equally, there are few who would not learn something to their advantage by drawing on those opportunities.

OPINION

Time is running out for jaw, jaw

Colin Challen MP



The science of climate change loomed large in the Lords debates on the Climate Change Bill. With a few exceptions – notable sceptics like Lord Lawson – parliamentarians in both Houses have taken their cue from the science, sometimes perhaps with the intention of adding an aura of invincibility to their arguments. Perhaps sceptics will object to my assertion that they don't refer to the science, but usually their reference to it is so selective as to be almost worthless. They use the old familiar rhetorical trick of taking things out of context, or looking for just one piece of counter information to assert that the whole theory has crumbled.

Nevertheless, the sceptics do serve a useful purpose in scientific dialogue, by forcing the 'true believers' to test their case against the evidence, so ensuring that their case is ever more robust. In this context, it was a relief to read a press release from the Met Office headlined "Climate Scientists clear up discrepancy in global temperature record." The report laid to rest one of the main sceptics' charges, that in the mid-20th century there was a drop in temperature which climate change scientists could not explain. Look deep enough, and eventually explanations will emerge. Personally, I would rather for the sake of all of us that one day the sceptics would be proven utterly right, and we could all relax and breathe a sigh of relief. The future might be much brighter. As it is, I much prefer that the basis of policy is tested evidence.

Sadly, the link between science and policy is often lost. What we seem to have, as I mentioned in an article in *Science* (I'm name dropping here), is a game of 'climate change poker.' We commissioned climate change scientists to tell us what was going on at a pre-G8 summit conference in Exeter in 2005; then we commissioned the Stern Review to tell us what the interplay between the physical science and the economic science might be. Now we have commissioned, so to speak, a Climate Change Bill which will attempt to put the lessons into practice.

I'm not sure it will succeed. Political science has stepped in, and we are now trying to marry real reality with political reality, always a Herculean task. Here we enter into the territory of cognitive dissonance, the term coined by psychologist Leon Festinger in 1957 to describe 'a psychological state that describes the uncomfortable feeling when a person begins to understand that something the person believes to be true is, in fact, not true.' (Wikipedia's definition).

We would like to believe that we are taking climate change seriously – hence the sound of energy-saving lightbulbs being screwed into sockets – but we are beginning to realise that our efforts are little more than displacement activities to keep us busy. Another example of this phenomenon, at the highest level, was described in the press recently as 'the optimism of global climate change negotiations.' Now we're not allowed to be pessimistic, lest we forsake the politics of hope. So it is convenient to use the science only as a kind of reference point, almost in a parallel universe that we can look in on before retiring to the 'real' world of politics. Scientists themselves sometimes seem content with this arrangement, since they abhor the possibility they may become politicised themselves.

Somebody has to call 'House' on this game. The climate change numbers are being used so loosely, they're almost irrelevant. For example, reviewing the literature, the Stern Review came up with an average figure of 1% GDP spent on mitigation to avoid between 5% and 20% later damages to GDP. Problem solved – until one realises that that 1% is predicated on an upper limit of a 550 parts per million by volume (ppmv) Greenhouse Gas atmospheric concentration, which Malthe Meinshausen told the Exeter conference would effectively lead us into the territory of up to or more than a 4 degrees temperature rise. Nothing like the 2 degrees we hear so much talk of, and which EU and UK policy is meant to be compatible with. If we were serious about say, a 450ppmv target, the GDP spend on mitigation would be around 3%. In 2006, when Stern's report was published, that would have amounted in the UK to £40 billion. We didn't spend anything like it – and it needs to be understood that the effort we fail to make one year merely compounds the following year's task. This stuff doesn't go away merely because we spent another year talking about it.

To solve the problem faster than we're creating it is the only useful definition of a solution we can afford. As it is, what has often been described as a game of numbers – politics – is failing catastrophically to pay any attention to the numbers of climate change. What we are doing could be worse than useless if it lulls us into a false sense of doing something useful.

The Charity Enterprise in Research

Simon Denegri
Chief Executive Officer,
Association of Medical Research Charities (AMRC), and

Sara Ellis
Communications Officer, AMRC

The role of charities in funding, advancing and promoting research for patient benefit is one of the unique success stories of medical and health research in the UK. This year the Association of Medical Research Charities (AMRC) is marking its twenty-first year as the sector's representative body by celebrating the impact that its 114 current members – both individually and collectively – have had on research and the research environment.

Scale and diversity

Whether measured in terms of the scale of its monetary contribution to medical and health research – £791 million in 2006-07, over £5 billion over the last five years, or the breadth and type of research activity its funding supports, the charity enterprise is now integral to the sustainability of science in this country.

About seventy per cent of all charity funding currently goes to Higher Education Institutions and historically a strong partnership has existed between charities and universities in developing a strong science base in the UK. In 2006-07 alone, AMRC estimates that charities funded over 3,000 scientists at different stages of their careers and many charities and universities have been able to realise shared ambitions for scientific endeavour through the development of world class research institutes and facilities.

Even a scant review of some of the most exciting and important research developments in UK health research – from the Human Genome Project (Wellcome Trust) to the development of anti-TNF therapy for people with severe rheumatoid arthritis (Arthritis Research Campaign) or ongoing trials of an artificial pancreas for Type 1 diabetes (Juvenile Diabetes Research Foundation (JDRF)) – underlines the central part that medical research charities have played in supporting research that has advanced our scientific knowledge and understanding and/or is helping develop new treatments, therapies and interventions. And further examples of such work – taken from our forthcoming booklet to be published this autumn showcasing the work of AMRC's members – are interspersed throughout this article.

The range of this activity reflects, of course the very diverse nature of AMRC's membership. Two of the world's largest charitable bodies funding medical research (Wellcome Trust and Cancer Research UK) are AMRC members and the British Heart Foundation and Arthritis Research Campaign are also significantly larger than most of our other members. Yet even those whose funding may only reach into the thousands rather than millions have often played a historically important role in funding and raising awareness, particularly if their field is a rare disease or condition.

Genetic research into a rare disorder has led to increased understanding of more common diseases.

Genetic research supported by Ataxia UK resulted in a landmark discovery, changing the landscape for patients and families with Friedreich's ataxia, a rare disorder of the nervous system which causes unsteadiness and lack of co-ordination.

Discovering which gene goes wrong in Friedreich's ataxia has improved diagnosis and made it possible to predict whether siblings will also develop the condition, paving the way for antenatal testing. Finding the mutation responsible means scientists can now study what the gene should normally do and have a target to treat when it goes wrong.

The charity has built on these advances by funding mouse models of Friedreich's ataxia. These are mice bred to have the same genetic defect as in the condition and which have some of the same physical characteristics. This invaluable resource is already allowing potential new treatments to be identified and tested, some of which may also be useful for more common diseases such as Alzheimer's and Parkinson's.

A bench to bedside journey to clinical trials

The Muscular Dystrophy Campaign has supported UK scientists in their efforts to find treatments and cures for over 40 types of muscular dystrophy. One of these, Duchenne, is an inherited condition, caused by an error in the dystrophin gene, resulting in progressive weakness as muscle cells break down and die. Like AMRC, 2008 marks a particular milestone for the Campaign. Twenty-one years ago, dystrophin was identified and since then research has aimed at understanding the function of this gene and its protein and developing new treatments based on this.

Now researchers are trying to find a drug that will increase levels of utrophin, a protein that is similar to the missing dystrophin. The charity's researchers at Oxford University have founded a biotech company to develop this work and clinical trials are now a realistic option. This progress illustrates the charity's aim of ensuring a smooth and speedy transition of promising technology from "bench" to "bedside."

Wellcome Images.

Quality

Together, AMRC's members represent over 90% of all funding available from the sector and their credibility – both as funders and as a voice in public debate about research – rests on their commitment to upholding the same standards in how they allocate this money.

It is a membership requirement of AMRC that all its members must abide by the Association's five principles of peer review: accountability; balance; independent decision-making; rotation and impartiality. Members' peer review practices are audited every five years by AMRC, the last time being in 2005-06. At that time, approximately 90% of its then 112 members fully met all five of these principles. In those instances where it was felt that member charities could strengthen and improve their approach AMRC has provided feedback, guidance and training as part of its core role of supporting members.

Another membership condition of AMRC is that member charities must have a publicly available research strategy in place. Such documents are important not only as the basis for openness and transparency with the public but are helpful in setting appropriate expectations with scientists and partner organisations and institutions about a charity's research priorities and the way it works.

Similarly, while the recent Charities Act rightly puts ever-greater emphasis on charities demonstrating the public benefit of their activities, it has actually been a long-standing concern of medical research charities not just to be able to understand and show the impact of their funding but also to disseminate the results of such research as broadly as possible. AMRC and its members have now taken part in two studies by the UK Clinical Research Collaboration (UKCRC) which have helped the wider science community better understand the role they play but also inform these charities as to how the activities they fund fit with the bigger picture. (See Figure 1)

Figure 1a

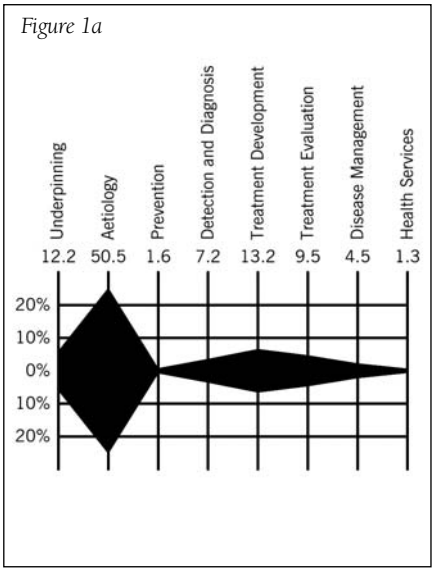


Figure 1b

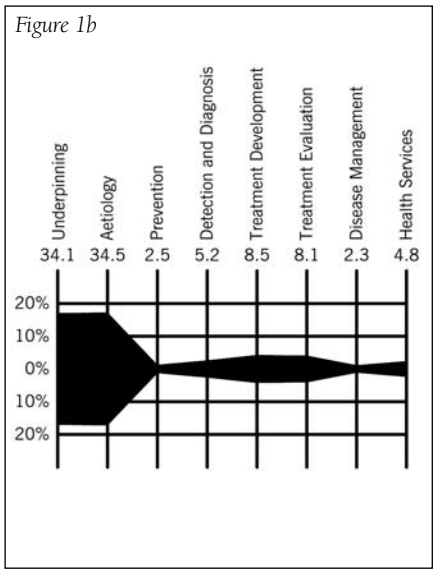


Figure 1. *Proportion of Total Spend by Research Activity*
Source: "From Donation to Innovation" UKCRC and AMRC, October 2007
1a. Medium and Smaller Sized Charities
Data from 29 medium and smaller sized AMRC member charities
1b. UK Health Research Analysis
Data from the 11 largest government and charity funders of health research in the UK

A unifying purpose

This overriding commitment to a common set of standards marks the UK sector out from its equivalents in

the US and abroad where the NGO sectors are more disparate, as does its unity of purpose and openness on issues such as the necessity and importance of animal research or stem cell research.

Indeed, it was concerns over attacks by animal rights campaigners on some of the shops run by an AMRC charity that was one of the key catalysts to motivating the Association's members to create a formal umbrella body in 1987 which it funds itself to look after its own interest. Twenty-one years later and this member subscription base – over 95% of all AMRC's funding comes from its members – is an important foundation of its 'independence' and credibility with those with whom it works.

Historically, another unifying cause for the sector has been its stance on non-payment of indirect costs of research funded in universities. The Government acknowledged the significant role played by charities by funders and their principled position on this issue by establishing the Charity Research Support Fund (CRSF) in 2004 to enable universities to cover these costs. Welcome though this was, the Government's monetary commitment to the Fund up until 2010-11 lags behind the anticipated growth in charity research expenditure. AMRC and its members are increasingly concerned that as a result charity money may diminish in value relative to funds from wholly government sources and reduce the nature and diversity of funding available to researchers in the UK.

Public engagement

Finally, the all-important footnote to this story is that the charity enterprise in UK research would not be possible on the scale we now see it, were it not for the ongoing support of the British public.

Their enthusiasm and desire to support research that will ultimately lead to finding the cause and cure for diseases and conditions affecting themselves, friends or family is reflected in the upward trend in donations to medical research charities over recent years: forty per cent of all donors gave to medical research charities in 2006 compared to just over 24% in 2003.

Medical research charities are now a trusted source of information to their respective patient constituency and are playing an ever-more important role in terms of wider public engagement on science. They are also finding new and innovative ways to bring this patient voice to bear upon issues of public debate such as the potential of 'human admixed embryos' but also in respect of their own research funding activities and related work such as the Parkinson's Disease Society's Research Network or Alzheimer's Society's QRD programme.

Conclusion

In the future, AMRC's credibility will continue to rest on the commitment of its members to funding quality research of public and patient benefit and the difference this has made not just to science but also to patients' lives in the UK. It is this 'difference' which remains our prime purpose and motivator and which we celebrate in this, our twenty-first year.

Charity-funded research as a catalyst for wider action

The earlier a stroke can be recognised, the better, yet stroke can be difficult to recognise and diagnose. In the late 1990's a team in Newcastle developed a simple test to enable ambulance staff to recognise a possible stroke. They named the test FAST (Face, Arm and Speech Test), and it looks at three issues - facial weakness, arm weakness and speech disturbance.

The Stroke Association recognised the potential of FAST and funded the team to research whether paramedics can accurately identify stroke using FAST – resulting in the establishment of FAST in ambulance services throughout the UK and as an integral part of training for paramedics.

The Association used their research findings in their 2005 *'Stroke is a Medical Emergency'* campaign, to increase awareness of stroke and its symptoms amongst the public, GPs and A&E staff. The Department of Health and policy makers were also targeted, to ensure adequate systems are provided to treat stroke as a medical emergency.

FAST was an integral part of the campaign, with leaflets and posters produced showing the symptoms of a stroke and stressing the importance of calling 999. These were distributed to many hospitals and GP surgeries, and now more than half the general public are aware of FAST, and the Department of Health has again funded the Stroke Association to publicise the message throughout the UK.

All Party Parliamentary Group on Medical Research

AMRC provides the secretariat for the APPG on Medical Research, which was established in 2005 by AMRC, Academy of Medical Sciences, Medical Research Council, Cancer Research UK and the Wellcome Trust. Details of the Group's previous and forthcoming meetings are published on our website at www.amc.org.uk

National Physical Laboratory - the UK's National Measurement Institute

Professor John Pethica
Chief Scientific Adviser, NPL

Professor Pethica took up the role at the tail end of 2007 and here lays out his vision for the future.

For 30 years I have worked across both public and private sectors, using cutting-edge science to establish new businesses and advise on public policy. This has taken me from the UK to the US and back again, via Ireland and Switzerland. The experience has given me an insight into how a publicly-funded laboratory can operate to optimum public and commercial effectiveness.

Now, as Chief Science Adviser at NPL, I am in a position to use this experience to help to shape one of the few remaining public laboratories in the UK. NPL is operated by SERCO, a quoted company, and so it functions as a private institution. Yet a large element of its funding direction and remit still comes from government sources, so it mixes public and private stakeholders and private and public drivers.

It is important to state that the core role of NPL is measurement. Basic things such as litres, weights, and more subtle and powerful quantities like time, require standards that people can trust. To have private companies provide these standards is not realistic. Would you like to see oil companies telling us what a gallon was and brewers defining the pint? Good standards require science with independence and public trust.

NPL has three over-arching roles that I want to outline in more detail. They are:

1. To promote and deliver top-end, quality science.
2. To make sure that that this science is exploited publicly and commercially.
3. To be an independent reference point.

Quality science

To achieve this, we need to ensure that we are doing great research. If NPL wants to provide definitive standards it needs to be as good if not better than anyone else when it comes to research. It also needs to be working in the right areas as a national measurement institution. The economy in the UK is not large enough to accommodate everything, so research areas need to be targeted wisely. NPL has to decide where its strengths lie and to play to them, and where there are new opportunities and areas where it can leverage its expertise. My role at NPL will ensure that the laboratories and support facilities enhance this process and that the talented people at NPL have what they need to deliver research at the cutting edge.

During the coming years, NPL will look to set the foundations for delivering leading science in support of measurement and standards. It will create an innovation centre to support UK businesses, focus on developing those areas where it is already close to the leading edge, and make strategic investments in areas where it believes a critical need for support will arrive in the future.

Successfully exploiting quality science

I believe that by enhancing its research capability NPL can expand the commercial application of its science and I want to fully exploit the public asset base of this knowledge for the benefit of the UK.

Successful commercialisation of top-end science is something that I have done throughout my working life so I am familiar with what needs to be in place for this to flourish. Following some work in the 1980s in Switzerland on equipment for thin-film characterization and in Cambridge developing nano-scale probe techniques, I set up a company called Nano Instruments. It was based in the US rather than the UK. I want to discuss why I believe that over 20 years later it is still not as easy to exploit science successfully in the UK as it is in some other areas of the world.

There are several reasons why the US works so well for exploitation of technical knowledge. One is the psychology of those looking to build new businesses there; they are happy

to take risks. In the UK there is more of a comfort zone mentality.

It is not all down to psychology. The environment of the US is another factor. The scale is large and all levels of its business eco-system are working – there are lots of companies of all sizes in this massive market, and they grow and are absorbed, created, and bought at all sizes. In the UK and Switzerland, we are not too bad at nurturing companies of small and large sizes but need a bigger market – which is where Europe can help. The bigger the market, the bigger return companies receive on their R&D investment, helping to successfully exploit new technologies.

So the US benefits from its market size, but just as important is the state and federal governments' role in the US tax and support system. I believe the UK is still behind the curve in this respect and the US is much more proactive.

Imagine the exploitation of knowledge and new research being dependent on the support of a three-legged stool or tripod, with each leg an equally vital component to provide a balanced success. One leg represents the science and technology itself. Another is the regulatory and legal system, and the final one is fiscal. To have one weak leg destabilises the system, making it more likely to collapse. This cannot be compensated by strengthening the other two legs. All three have to be internationally competitive.

In the UK our research base continues to be excellent, with a superb reservoir of talent. The regulatory and legal system is also very encouraging, as the recent vote on the Human Fertilisation and Embryology Bill shows. But fiscal support is the weak leg that threatens the whole structure and makes the UK less competitive. One example is the corporate tax rates that negate any benefits of research freedom or grant support. It simply makes other countries, especially our Irish and Swiss neighbours, a far more attractive proposition for starting a business or for investment. Other countries such as the US in fact do everything in their power to tilt the balance in favour of their local companies, making them better equipped to succeed in the global market. It's not just tax rates, but things like Small Business Innovation Research (SBIR), long range US Department of Defense research, and a willingness to radically shut down less promising areas. If other countries do not have 'level playing fields' then why should UK companies not have a competitive tax and support environment? You can see what a 10% effective tax rate in the finance sector did. Opportunity costs must be allowed for in research as in everything else.

Because of its position between the public and private sectors, NPL has an important role to play as the broker of a better landscape for technology transfer in the UK. We can demonstrate to the commercial world how public research can serve the needs of business. We can also be a mouthpiece for businesses, helping them feed messages back from companies trying hard to succeed in a system that has not been designed to offer them so much competitive advantage. We are experts in technology transfer and we will use this expertise to guide for the future as well as deliver today.

Providing a reference point

By establishing standards NPL provides a level of confidence, trust and independence that comes from being a leading scientific institution. UK Government may need an independent, credible public laboratory perhaps more than it currently realises. It cannot just buy unbiased technical advice and credibility from purely commercial entities, as they are (rightly) interested in retaining a contract. You also can't guarantee the independence and confidence unless you're doing cutting edge, published science. Indeed you have to lead the field, which comes back to the first role of NPL.

There are laboratories similar to NPL in other countries, such as Physikalisch Technische Bundesanstalt (PTB) in Germany and National Institute of Standards and Technology (NIST) in the US. NIST has a central role in establishing security procedures and information handling for the US Government, something I believe that NPL could help with in the UK. NPL actually has a famous track record in this area with the invention of packet switching, which is the basis of computer communications and the internet worldwide today. It was developed by Donald Davies at NPL from the 1960s. As systems get more complex, the protocols and standards also get more complex. NPL has the expertise to help with that.

Industry, as well as government, relies on an independent reference point. NPL provides the ultimate in confirmation when it says that something meets a standard which a company wishes to claim it is meeting. And it is very desirable for the UK to have an interest in the process by which international standards are set, to support its own corporations.

NPL responds to the kind of industries that are predominant in this country, which is why there's a strong emphasis on materials research, quality control, materials analysis for example.

NPL can increase the effectiveness of industry and help with the transfer of research and development into actual products and services. Underpinning this will be its work in informing new standards and regulation. At root, it is a publicly trusted point of reference for science and technology. The talent pool is here and we are building the infrastructure to support those areas that will produce the high quality science we need to take the laboratory forward for many years to come.

The Search for Life on Mars

*Ray P Carvell, Mark R Sims, Mark A Sephton and Lindsay Dannatt**

For centuries, humans have been fascinated by the possibility of life on other planets. Recent robotic spacecraft have given us tantalizing hints that primitive life may have existed – or, perhaps, still exists – on our neighbouring planet, Mars. The European Space Agency set up the long-term Aurora Programme in 2001 (see Box 1) and its first mission, ExoMars, will be presented for approval to the ESA Ministerial Council in November 2008. The main scientific objective of ExoMars is to establish whether life on Mars has ever existed or is still active today. The technological and scientific developments required to make ExoMars possible have already started to deliver commercial benefits for the UK with the promise of many more to follow. This note provides an overview of ExoMars and discusses the benefits of the UK's involvement.

What is the Aurora Programme?

The Aurora Programme is part of Europe's strategy for space which was endorsed by the European Union Council of Research and the ESA Council in 2001. This strategy calls for Europe to:

- explore the Solar System and the Universe
- stimulate new technology
- inspire the young people of Europe to take a greater interest in science and technology

The primary objective of the Aurora Programme is a European long-term plan for the robotic and human exploration of the Solar System. ExoMars is the first in a series of Aurora missions that will lead to the return to Earth of a sample from Mars. The UK is playing a leading role in ExoMars and the Aurora programme.

Background

The origins of ExoMars go back to 2000 when ESA began studies for a mission which would land a rover on the surface of Mars. This rover was to carry a sophisticated automatic laboratory capable of detecting and analysing traces of life, both present and past. In 2006, ESA awarded a design contract for the ExoMars mission to Thales Alenia Space, Italy, with a major subcontract for the rover going to Astrium UK. In the same year, a provisional selection of scientific instruments was made which, in addition to life detection instruments, included instruments to measure the Martian environment. UK scientists are leading four of the 23 scientific instruments and are heavily involved in the design of seven others. The design phase is well advanced and it is expected that manufacturing will start early in 2010.

The Mission

ExoMars will be ESA's second mission to Mars and will build on the expertise gained from its 2003 predecessor, Mars Express Orbiter which itself has been spectacularly successful but carried the ill-fated Beagle 2 lander. It will be launched on an Ariane 5 rocket from ESA's spaceport in French Guiana in November 2013, followed by a landing, using parachutes and airbags, on Mars in late 2015. The exact landing date will be chosen after ExoMars goes into orbit around Mars in order to avoid Martian dust storms.

Why look for life underground?

During the Martian day, the surface of Mars is exposed to intense ultraviolet light from the Sun which passes easily through the thin Martian atmosphere. During the Martian night, the surface drops to -100°C or even colder. These conditions are not conducive to life.

However, there is a more benign environment a few centimetres below the surface where ultraviolet light cannot penetrate and the temperatures are less extreme. More importantly, data from instruments on board spacecraft in orbit around Mars strongly suggest that large quantities of water ice exists in the porous layer of soil some 30 to 60 centimetres beneath the surface in some areas. It is known that some types of organisms live successfully in very similar conditions on Earth.

The ExoMars drill is mounted on the rover and will deliver samples from below the surface to the rover's life detection and characterization instruments.

Getting to Mars

Mars is a 'near neighbour' of the Earth but, even at its closest, it is 35 million miles away and landing a spacecraft on its surface is not at all routine. To date, there have been 10 attempts to land spacecraft on Mars and only 5 have been successful – including 3 since 2003. Just 2 carried rovers. So far Europe has made only one attempt at landing on Mars.

**Ray P Carvell, Brightwell Instruments Ltd, Sotwell Street, Wallingford, Oxfordshire OX10 0RH.*
Mark R Sims, Space Research Centre, Department of Physics and Astronomy, University of Leicester, Leicester LE1 7RH.
Mark A Sephton, Earth Science and Engineering, South Kensington Campus, Imperial College London, SW7 2AZ.
Lindsay Dannatt, Science and Technology Facilities Council, North Star Avenue, Swindon, SN2 1SZ.

In addition to the rover with its cameras, exobiology laboratory and drill for collecting samples from up to 2 metres below the surface where life is thought most likely to be found, the ExoMars lander will carry an environmental and geophysics science station.

The rover and lander instruments are designed to collect scientific data for at least 6 months after landing and may last much longer depending on the severity of the conditions encountered on the Martian surface.

The Science

ExoMars is expected to answer important questions including:

- Has there ever been life on Mars?
- What is the present day environment on Mars?
- Has Mars ever had an environment that could support life?
- How has the Martian environment changed over time?
- How do planets form and evolve?

Answers to these questions will increase our understanding of the uniqueness – or otherwise – of life on Earth, within our Solar System and in the Universe.

The Technology

UK industry and scientists are working in partnership to deliver commercial benefits for the UK from ExoMars and the Aurora programme. Examples include:

- Unmanned vehicle technologies that can be applied to situations here on Earth in remote, unstructured or hazardous environments.
- 3D multimedia technologies that will create new virtual reality experiences of planetary exploration for research, outreach and commercial exploitation.
- Highly innovative miniaturised instrumentation using low-temperature catalysts that are needed for the future biotechnology industry.
- New solvent systems that provide flexible, safe and economic extraction procedures so that industries of the future can operate in a clean environment.
- Advanced fluid dynamics simulations of ExoMars' entry into the Martian atmosphere that will improve operational tools for modelling high-speed flight on Earth.

Key parts of the mission including the rover are being built by UK industry. The rover will be the most sophisticated exploration vehicle on Mars and the first to use a drill and radar to explore beneath the planet's surface.

The Skills

In the UK, over 16 companies and 18 research institutions are presently involved in ExoMars. It is anticipated that over 250 UK engineers, technicians and scientists will be employed on this mission. A wide range of high-level skills are needed including electronic engineering, mechanical engineering, thermal engineering, robotics, software design, materials science, microbiology, contamination control, systems engineering, product assurance and international project management. These are applicable to many other industries.

At least 100 scientists will study the data collected by ExoMars which, in addition to answering the key scientific questions, will be used to plan future Aurora missions.

The Future

ExoMars is the first in a series of missions that will lead to the return to Earth of a sample from Mars and, in the more distant future, perhaps a manned mission. The instruments and technologies which are being developed for ExoMars are stepping-stones for these later missions.

The People

ExoMars' ground-breaking science and engineering will inspire and encourage the next generation to become the highly skilled scientists and engineers which Britain will need in the future.

In support of this, an outreach programme involving schools, colleges and the general public is being planned with some pilot work already under way.

The Funding

The UK's involvement in ExoMars is funded by the Science and Technology Facilities Council, one of the UK's seven research councils, and a partner in the British National Space Centre, which co-ordinates the UK's civil space activities. As Aurora is an optional programme of ESA, the level of return (industrial and science) to the UK is dependant on the level of funding. Currently the UK is the second largest contributor after Italy.

Further information about the Aurora Programme and ExoMars can be found at :
http://www.scitech.ac.uk/SciProg/Aurora/auroraHome.aspx
http://www.esa.int/esaMI/Aurora/
Further information about water ice on Mars can be found at:
http://news.bbc.co.uk/1/hi/sci/tech/7294767.stm
http://news.bbc.co.uk/1/hi/sci/tech/2009318.stm
http://news.bbc.co.uk/1/hi/sci/tech/120270.stm
http://www.sciam.com/article.cfm?id=mars-odysseys-measurement

20 Years of the Parliamentary Office of Science and Technology (POST)

Part 1: the First 10 Years

Next year marks the 20th anniversary of POST's services to Parliament, but it is already over 20 years since the Parliamentary and Scientific Committee (P&S) established the charitable foundation which allowed POST to be created. Dr Michael Clark, who was Treasurer at the time and later became Chairman of POST's Board until 1997, and Prof Michael Norton, POST's first director, look back on initial objectives and early experience, and how relevant these were to Parliament's current needs. In the next issue of SiP, the current Chairman and Director will bring the story up to the present and offer some thoughts about the future.

A Brief History of POST

Since 1939, the P&S had encouraged Parliamentarians to explore the implications of scientific developments for society and public policy, but as our economy became more dependent on technological progress, and the negative effects of technology (especially on the environment) became more apparent, some felt that Parliament needed its own resources on such issues. Parliamentarians not only required access to knowledge and insights into the implications of technology for their constituents and society, but also needed to exercise their scrutiny functions over legislation and administration. This thinking was also influenced by the fact that specialised parliamentary science and technology organisations already existed overseas.

Some P&S members (Sir Ian Lloyd MP, Sir Trevor Skeet MP, Sir Gerry Vaughan MP, Lords Kennet, Gregson and Flowers among others) visited already-established organisations in the US, Germany and France, and this reinforced their view that modern Parliaments needed their own 'intelligence' on science and technology-related issues. Initially they asked the then Thatcher government to fund such services at Westminster but were asked first to demonstrate a real need. This led to the P&S creating a charitable foundation to raise funds from P&S members; the reaction was sufficiently positive to be able to recruit a Director from April 1 1989.

POST's Original Mission

POST's formation followed overseas models by adopting the principle that it should **serve both Houses**, and its output should be apolitical and of potential value to Parliamentarians of all parties. POST should access external scientific expertise, and should deliver clear, easy to understand, accurate and objective reviews. Thorough quality-control should ensure that MPs and Peers could have confidence in the information should they wish to cite it in debate. These principles were reflected in the structure of POST's Board with members from the Commons and Lords together with distinguished scientists and engineers from the wider world.

Overseas models were internally funded (the US Congress' Office of Technology Assessment (OTA) had over 100 staff, and European equivalents typically 10 to 15); in contrast, POST in 1989 had one director, a secretary and also needed to raise its own funds. The new POST thus faced a serious conundrum! POST's founders had been inspired by detailed and lengthy 'technology assessments' (TA) carried out overseas (Table 1), however POST lacked the resources to do the same. This forced us to think carefully about the real needs of our Parliament. These seemed to fall into two categories. Firstly there was the individual MP or Peer for whom information and analysis had to be delivered in a form that could be absorbed quickly. Lengthy reports were not likely to be much use to the busy Parliamentarian juggling many tasks every day and lacking support staff. We thus decided to focus initial briefings into a 2-4 page 'POSTnote' format.

Table 1 Principles of Technology Assessment[1]

• interpret, analyse and anticipate technological issues of interest to Parliament
• set out the facts and identify where agreements and disagreements exist
• analyse the interactions between policy and scientific and technological developments
• discuss potential options for parliamentary action, and their ramifications
• assure objectivity and relevance to the parliamentary process
• contribute to the effectiveness and credibility of the parliamentary process by helping decisions to be better informed.

A fundamental precondition was relevance to Parliament; thus POST's agenda was always decided by the Board which, through its structure, could assess both parliamentary and scientific relevance. Early subjects related to short-term issues (eg human embryo research, computer misuse, oil rig disposal, Kuwaiti oil fires, etc), while others contributed to longer term awareness (eg ozone layer depletion, global warming, antibacterial resistance, risk assessment, etc). Both types helped Parliamentarians to contribute in debates and exert influence on government.

However POSTnotes, while useful for background understanding and for supporting brief interventions (eg in PQs or debates), did not allow subjects to be explored in sufficient depth for the detailed scrutiny role of Parliament. As soon as resources allowed, we thus supplemented POSTnotes with more detailed analyses where the Board believed it could help individual Parliamentarians or select committees to examine the policy aspects of science and technology issues in greater depth.

From Birth to Adoption

POST attracted more resources and by the time of the 1992 inquiry into the funding of POST, there were three specialists, as well as short-term secondments from organisations such as Research Councils. The Information Committee recommended that Parliament should adopt POST for an initial three years[2] and subsequently at a second inquiry for five years[3]. In both inquiries, the burden of proof was put on POST to demonstrate utility as well as output, so we used questionnaires to assess real interest and demand from Parliamentarians and committees.

The Commons Information Committee assessed the case for POST against the background that Parliament already had a Science and Environment Section in the Commons Library and that select committees (especially the Lords Science and Technology Committee) also inquired into technological issues. However, thanks to close and friendly working contacts, we had ensured services remained complementary and endeavoured to create a proper position for POST between Library briefings and investigations by committees. An example of synergistic relationships with select committees was the POST study on radioactive waste which was taken as the 'basic text' for the Lords Science and Technology Committee's 1998 inquiry.

The first 10 years

With hindsight we can categorise POST's output as:

- helping individual Parliamentarians develop their own view on a scientific issue
- contributing to informed debate in the chamber
- providing information of value in reacting to constituents' concerns
- identifying potential subjects or laying the groundwork for committee inquiries
- providing support on particular issues during or after an inquiry.

POST material[1] was cited in debate, used as a subject for an adjournment debate, provided initial analyses for committee inquiries, or actually brought future developments to the attention of Parliament for the first time. To be relevant to Parliament often means covering issues where there is fierce controversy, as can be seen in some of the subjects tackled – research involving human embryos, animal testing, illegal drugs, and radioactive waste.

But how did our experience compare with the other Parliaments on which POST's rationale had been based? Ironically, the US OTA (formed in 1971) was zero budgeted by the new Republican Congress of 1995. At that time we considered whether this had any implications for POST but concluded that this reflected US internal politics rather than a reduced demand for analysis of science-based issues. Indeed, OTA's demise contributed to the era where science became "cherry picked" to support particular political ideologies rather than informing policy[4]. Congress has since had second thoughts by re-establishing a TA service. In contrast with the USA, TA in Europe has spread and the European Parliamentary TA Association (EPTA) network has grown from the 6 members in 1989 to 18 now[5].

Present needs of Parliament - have they changed?

We wonder if Parliament's need for support has changed in these 20 years. Of course, science changes, but we do not believe its importance to society and Parliament has lessened. Science and technology continue to raise ethical issues where Parliament needs to consider what rules and norms to apply. Twenty years ago it was human embryo research; more recently stem cells. Twenty years ago there was debate over the human contribution to global warming; now it is over how on earth can we slow and adapt to it. Some, such as how to use IT effectively, seem to be fixtures!

Parliamentarians remain the target of lobbying – for example on global warming, there have been well-funded campaigns of 'spurious science'[6] aimed at manufacturing uncertainty in the science which bodies like POST can help put into an objective perspective. Equally, 'joined-up' government remains elusive – there is a government target for greenhouse gas reduction but departmental decisions (whether on transport or on energy) remain fragmented. Such policy issues invite parliamentary scrutiny supported by detailed and objective policy analysis. Indeed one of the visions of POST's founders was to cut across disciplines and departments – a systems approach to policy analysis. Other examples are that there are often unintended consequences from actions – eg concerns over the scale of animal testing conflict with rules on testing more chemicals and food supplements. Our future changes

rapidly – eg what are the implications on transport demand projections of oil at current or even higher prices? As seas rise around our coasts with a growing population, some difficult technological and societal choices may also have to be made in the future. POST's founders would have seen POST, with its ability to access external networks of experts, stakeholder groups and professional societies, as well-placed to help Parliamentarians exert effective and insightful influence on such issues.

Finally, though it is right that POST be assessed on its value to Parliamentarians and committees, we should not lose sight of the original objective to help raise the credibility of the parliamentary process as a whole. We believe that technology assessment, by engaging leading experts and stakeholders in the process, helps improve understanding of the parliamentary process. Some of the early POST reports (eg Tunnel Vision, Nanotechnology, Dealing with Drought, the BSE crisis, and Technology Foresight) had a significant impact outside Parliament[1]. This, in our view, not only raised Parliament's credibility but also helped inform subsequent dialogues between Parliament and the stakeholders on the issue concerned.

Notes

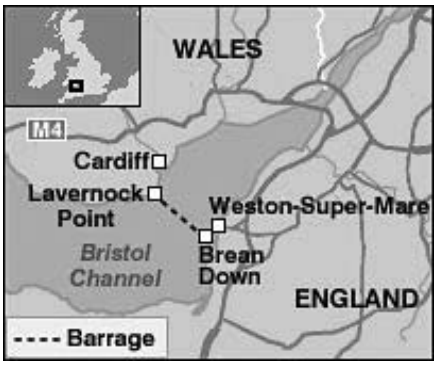
1. POST's activities to 1998 and those of other countries' equivalent offices are described in "Parliaments and Technology-the development of Technology Assessment in Europe" (N. Vig and H. Paschen eds). SUNY Press, 2000.
2. Report of the Commons Information Committee on POST (Session 1991-2. HC325).
3. Report of the Commons Information Committee on POST (Session 1994-5. HC578).
4. Many examples are in Chris Mooney's "The Republican War on Science". Perseus Books, 2006.
5. http://www.eptanetwork.org/EPTA/
6. Norton, M.G., Kass, G., and Allum, N. "Combating Spurious Science". ***Science and Public Affairs***, Dec 2007, p18.

The Severn Estuary: A Barrage or a Bore

Robert Freer

Using the very high tides in the Severn Estuary as a free and perpetual source of hydro-electric power looks very attractive at first sight. Until it is examined more closely. A new feasibility study commissioned by the Government has revived interest in this much discussed project.

The basic idea is straightforward and uses established technology. A barrage housing sluice gates and turbines would be built across the estuary. The gates would be opened as the tide floods in and closed at high tide to impound the water behind the barrage. As the tide recedes the water would be released through the turbines to generate electricity for a few hours until the tide starts to rise again. The turbines would be generating electricity for about a quarter of the day.



But in practice there are some snags. Although the electrical output is predictable (because the tides are predictable) it would vary throughout the year. At the spring and autumn equinox the maximum tidal range at Avonmouth is 40 feet, but it is only about half that during neap tides at the summer and winter solstice. The electrical output would then be correspondingly less.

There is also the problem of matching the electrical output to the daily demand for electricity which is supplied by the Grid. The tides are generated by the moon and they rise and fall according to the lunar cycle. High tide occurs at a different time during the day and hence so does the electrical output. The cycle repeats every two weeks. But we live our lives according to the solar cycle and our electrical demand follows a regular pattern every day.

The national electrical demand supplied by the Grid is low at night (about 35GW) but starts to rise from 5am to a plateau at mid morning. Then it rises to a peak at 6pm (60GW in winter) after which the demand falls again.

When the maximum output from the turbines coincides with the peak electrical demand the power generated (up to 8.6GW) is particularly valuable and would command a high price because it would replace expensive electricity from alternative stand-by plant. But this happens only once a fortnight. At other times the value of

Thomas Fulljames' Proposal for Severn Barrier 1849 - Now the site of the first Severn Bridge

the electricity generated would be progressively less. Electricity generated in the middle of the night would have a low value.

In the present proposals the barrage would be built from Brean Down, a headland south-west of Weston-super-Mare in Somerset, to Lavernock Point between Cardiff and Barry in South Wales. It would be 9 miles long and contain 216 axial flow turbines each of 40MW rated capacity making a total installed capacity of 8,640MW. The annual output would be 17 Twh, which is 5% of the national annual demand of 382 Twh. The annual average load factor would be 23%. There would be 176 sluice gates and two large locks of sufficient size to allow ships to pass through to the Avonmouth docks. A roadway on top of the barrage would provide another road link between Bristol and Cardiff.

Construction would take about 8 years and the cost is estimated to be £15bn but the public may be sceptical of these estimates when they remember the increase in final cost for other major building projects such as the Channel Tunnel, the Scottish Assembly building and the Olympic Games.

The project has the support of the Sustainable Development Commission but has been criticised by birdwatchers who are concerned that intermittent flooding of the estuary may disturb some species of birds. They are seeking alternative habitats to be provided for the birds. A separate Strategic Environmental Assessment study has been started to look into this and other environmental concerns, but the study may become unnecessary if the birds simply fly away and find their own alternative feeding grounds.

Commissioning reports and feasibility studies can too easily become a substitute for action, giving the illusion of action in place of decision. No amount of studies, however long and expensive, will build the barrage. At some stage a decision to go ahead or not must be taken.

But if the decision is taken to build the Severn Barrage it would be sensible to first build a similar but smaller hydro-electric barrage elsewhere, for instance on the Mersey or the Wyre, to learn about the practical problems during construction and operation.

Is the Severn Barrage a sound investment? It depends what you are trying to achieve and, as always for projects with a high initial cost, on the assumed discount rate. The barrage is a much better investment than building more wind turbines on at least five counts:

- The output is entirely predictable, whereas the output from wind turbines is not.
- It would generate four times the amount of energy that we get from all the present wind turbines.
- The peak output is particularly valuable when it coincides with the peak demand on the Grid.
- The electricity is generated near the major demand centres of Bristol and Cardiff and therefore the transmission costs are small.
- It provides another road crossing of the estuary.

But the barrage cannot generate the secure base load power on which we all depend to run our industries, offices and homes, and without which the country would come to a standstill. Anyone with £15bn to spend on generating low carbon electricity might be better advised to invest it in nuclear power.

Severn Estuary Photo by Tim Britton

Engineering Challenges towards Personalised Medicine

Professor Paulo Lisboa

Professor in Industrial Mathematics, Liverpool John Moores University

Introduction

Advances in medical science, biomedical engineering and molecular biology, coupled with social attitudes centred on consumer choice, point towards tailoring medical care to the specific needs of individual patients. The agenda of personalised medicine is further driven by growing economic, social and technological pressures, including:

- Cost of healthcare provision, in particular for the ageing population such as the management of chronic diseases and cancer. This has generated a growing demand for ambulatory care, autonomous monitoring and control, and intelligent decision support for clinicians and patients alike.
- Litigation, which diminishes margins for human error thus spurring greater reliance on technological assistance.
- The accelerating pace of science and technology which is opening up new and compelling possibilities for healthcare development with a concomitant growth in public expectations.
- Personalised medicine is at the cusp of a very considerable worldwide market, where the UK is well placed to assume a position of leadership. Success in exploiting this industrial base will impact on the balance of trade with our main economic competitors.

Implications for policy on Science, Engineering and Technology (SET)

Sustainability of healthcare delivery and competitiveness of the UK industrial base must link three complementary strands:

- distributed research across a significant range of priority areas and providers in SET
- tailored specific clinical need through the Department of Health, and
- substantial improvements in regulatory and procurement practices to promote uptake by medical industry.

Priority areas for Science, Engineering and Technology (SET)

Leadership in radically new models of healthcare delivery will in the future be even more dependent on rapid advances in SET. While there already are significant interdisciplinary funding initiatives with a healthcare focus, this review has identified the following priority areas for further consideration:

- Translational research – metabolic phenotyping can form the basis for targeted large-scale lifestyle interventions as well as mapping disease progression and response to therapy. Moreover, identification of disease sub-types and elucidation of phenotypic pathways open the way to personalised therapy including drug discovery, maximising response to therapy and minimising adverse effects. There is a considerable way to go in developing mathematical science and informatics for accurate and reliable modelling of these very large and complex biological networks.
- Multi-modal data fusion – integration of multiscale measurement from molecular biology through histology, electrophysiological measurement, morphological and functional imaging, to clinical signs and indeed population based hospital episode statistics, still has vast potential for delivery of decision support. This includes tailoring patient specific physiological models to clinical data, but extends to integration of electronic health records in large federated databases that are distributed, yet reliable and secure. Further exploration of the electromagnetic spectrum is still needed to devise novel minimally invasive analytical imaging modalities capable of operating at low cost.
- Convergent platforms – inter-operability of clinical measurement platforms of different commercial sources and operating in different modalities and their integration into workable data management systems with multimedia patient records requires wide ranging research covering, among others, harmonised standards, wireless technologies that are reliable, efficient and effective, data fusion and information management with formal semantic ontologies.
- Decision support – objective measurement is still lacking in key areas of clinical management, including cytology. It is also recognised that best practice needs to be more consistent across healthcare providers, while failure reporting must become more systematic with systemic filters put in place using better decision support. Moreover, patient information needs to embrace the electronic age to cater for widely different levels of intended involvement in informed consent to treatment. This requires novel approaches to patient information. Considerable potential exists also for interactive models for self-care, in particular for younger age groups where chronic diseases can take a heavy toll casting a long shadow. Furthermore, autonomous, privacy protecting activity monitoring can enable independent living to a later age, especially in the face of episodic need for health or social care support.

In addition, public engagement is crucial in enabling the development of pre-emptive medicine to pre-empt high cost care. This is not just to ensure acceptance of novel forms of healthcare delivery, but also to expedite efficiency and effectiveness in design and deployment, the more so as models of care evolve from curative to preventive and so from passive to participatory.

Dr John Snow: an unsung hero of water and sanitation

Dr Rosalind Stanwell-Smith

Hon Senior Lecturer, London School of Hygiene and Tropical Medicine, scientific advisor to the Royal Institute of Public Health and Secretary to the John Snow Society

Monday 16th June was the 150th anniversary of the death of Dr John Snow (1813-1858), who, at the age of 45 had already achieved excellence in three areas of medical science: anaesthesia, the epidemiology of waterborne disease and the chemistry of various compounds and poisons. He became the first professional anaesthetist shortly after ether was demonstrated as an anaesthetic in 1846 in the USA, applying scientific method where others treated it as a novelty; and his expertise with chloroform in childbirth made pain relief for labour respectable when Queen Victoria praised that "blessèd chloroform". But in this WHO Year of Water and Sanitation, we should applaud him particularly for his proof that cholera was spread by drinking water contaminated by sewage.

Professor Jim Feast, ***President RSC***; Rt Hon Alan Johnson MP; Dr Ros Stanwell-Smith, ***John Snow Society***; Mr Jeremy Pelczer, ***WaterAid***.

In 1854, Snow was working as an anaesthetist in London when a savage outbreak of 'King Cholera' occurred in Soho, killing 500 people in a few days. As a young doctor in Newcastle, Snow had witnessed one of the first UK epidemics of cholera: in 1831 he was sent to the mining village of Killingworth to treat the cases. He described the mine as one huge privy where men ate without washing their hands: his early – and at the time outlandish – suspicion that cholera arose from the excrement of cases was strengthened by studies in London, indicating higher rates of cholera where the water supply was more contaminated. The 1854 Soho outbreak supplied the final evidence: for example, brewery workers were spared because the brewery had its own well, while others had to take water from street pumps (so, although he was a teetotaller, the pub now bearing his name could be said to commemorate the brewery evidence). Evidence from a map of cases implicated the Broad Street pump: this early use of medical geography has made Snow an icon for cartographers, although Snow also realised the importance of outlying cases, for example a widow in Hampstead who had resided in Broad Street and so liked the pump-water that she had a flagon of it sent to her daily: she became the only recorded case of cholera in Hampstead during that epidemic. Snow persuaded the parish guardians to take the handle off the Broad Street pump – an act commemorated by a plaque on the pub at the site in what is now called Broadwick Street. Later investigation of the pump's well showed that sewage from an adjacent cesspit had seeped into the water.

Snow published his findings in '*On the Mode of Communication of Cholera*': bacteria had not yet been isolated and the idea of disease carried by water was considered laughable by many, including the medically trained editor of *The Lancet*. However, the problem of contamination of street wells was appreciated: a Cholera Inquiry Committee concluded in 1855 that all surface wells should be abolished and that water companies should provide a continuous supply of water – previously supply had been limited to about 2 hours a day and never on a Sunday. London's sanitation was appalling, with sewage contamination of the Thames worsened by widespread installation of water closets: scarcely a month after Snow's death the 'Great Stink' of July 1858 prompted, at last, the legislation required to install a scientifically designed sewer system in the city. Joseph Bazalgette, Chief Engineer to the Metropolitan Board of Works had been waiting years for agreement to his plans. The modern flushing toilet, invented in England, could now discharge safely and public conveniences were also pioneered in British cities. Although Snow's work provided the essential evidence that sewage should be kept away from drinking water, there is no memorial to match that of Bazalgette on the Thames Embankment.

As the chair of the Inconvenience Committee of professional Blue Badge tourist guides, I would argue that he would have supported our campaign for free public toilets for all visitors and tourists as both necessary to a civilised society and based on good hygiene science and medical need. It probably requires legislation and a change of view, just as was needed for the control of wells and Bazalgette's sewer plans – and perhaps benefactors such as Richard Whittington, who as Mayor of the City of London bequeathed a large public toilet by the Thames in 1423. Whether or not you agree, raise a glass of our now safe drinking water to Dr John Snow to celebrate the anniversary of a great British scientific hero.

Hands-on Science

Tina Overton
Professor of Chemistry Education, University of Hull and
Director, Higher Education Academy Physical Sciences Centre

Introduction

In 2005 the Secretary of State received a report from the Higher Education Funding Council for England (HEFCE) that identified Science, Technology, Engineering and Maths (STEM) disciplines as both strategically important and vulnerable. Their vulnerability was measured by a mismatch between the supply of suitably qualified graduates from higher education and the demand for such graduates from UK industry and commerce. The problem becomes clear if we look at the numbers of young people entering higher education to study STEM disciplines. Data show that the numbers entering first year degree programmes have, at best, remained steady over the past twenty or so years. This covers a period of rapid expansion in the numbers of 18 year olds entering higher education. Therefore, the STEM disciplines have seen a real and drastic reduction in their market share of the cohort.

It is enlightening to look at the numbers of applications for undergraduate science courses versus numbers of acceptances for such courses. For example, in 2007 15,567 people applied to study physical sciences through the Universities and Colleges Admissions Service (UCAS). However, 15,801 finally accepted places in such programmes. Thus, more undergraduates are accepted on physical science programmes than originally applied for places, suggesting that many of them may not even be very committed to their programme of study. This mismatch is probably due to the large numbers who apply for but do not get accepted onto courses such as medicine and veterinary science.

We look to the teaching profession to inspire our next generation of scientists. However, it is well known that there is a chronic shortage of specialised teachers of chemistry and especially physics and many pupils are not taught science by a subject specialist. The numbers of entrants to Post Graduate Certificate of Education (PGCE) courses has remained very stable despite the introduction of incentives such as the 'golden hello'. It is crucially important that enough well-motivated, enthusiastic scientists enter the teaching profession if the number and quality of undergraduates entering Higher Education (HE) is to increase to meet the demands of commerce and industry.

These issues are being tackled in some ways. The enhanced 'golden hello' for trainee teachers may not be increasing the numbers entering the profession but it may well be increasing competition for places of PGCE courses which in turn will mean that the better qualified applicants are recruited. There are several support mechanisms for science teachers to enable them to take part in Continuing Professional Development (CPD) and to improve their skills. In addition many organisations are now engaging directly with schoolchildren in an attempt to enthuse them about science.

Support for science teachers

The Association for Science Education is a professional organisation that exists solely to support science teachers and to improve the quality of science teaching. The Association runs a number of very successful conferences and publications and has a wide membership from within the teaching profession.

Science Learning Centres are a national network for professional development in science teaching. The Centres support teachers in enhancing their professional skills by learning more about contemporary scientific ideas and in experimenting with effective teaching approaches and gaining experience of modern scientific techniques. Their challenge is that they have to charge for their services and that teachers often have difficulty being out of school to attend events.

Most of the professional bodies such as the Institute of Physics and the Royal Society of Chemistry provide resources for science teachers to use in the classroom as well as offering opportunities for in-service training.

Universities are increasingly offering support to teachers by offering events for pupils or conferences and resources for teachers themselves. Industry also provides many teaching and career education resources.

The relatively new regional STEM Centres are attempting to bring together all the offerings in support for STEM in a 'one stop shop' approach. They provide a single contact point for teachers looking for support for any area of the curriculum.

Direct interaction with school children

Academia, industry, professional bodies and other organisations are increasingly becoming involved with direct interaction with schoolchildren in an attempt to turn them on to science. Their approach is usually via

curriculum enhancement and enrichment activities with a focus on providing access to exciting hands-on activities. These activities also often provide positive role models and some insight into science-related careers.

A selection of 'hands-on' focused projects is described here:

'Hands-on science' is an EU Socrates Comenius-funded project that aims to promote experimental teaching of science as a way of improving in-school scientific education and science literacy in society

'Hands-on science' is also the title of a Higher Education Funding Council for Wales (HEFCW) funded project that aims to promote, enthuse and increase the number of pupils studying science, maths and health-related subjects beyond the General Certificate of Secondary Education (GCSE).

'Chemistry: The Next Generation' is managed by the Royal Society of Chemistry and funded by HEFCE. It aims to promote the excitement of chemical sciences and demonstrate good career opportunities.

'Stimulating physics' is managed by the Institute of Physics and funded by HEFCE to increase the number of people taking physics courses at A-level and degree level.

The HEFCE funded 'London engineering project' aims to alter the student uptake into engineering courses, provide tomorrow's engineering workforce, allow London students to claim their place in the technology-based future of London.

The HEFCE-funded 'Moremathsgrads' aims to develop, trial, evaluate means of increasing the numbers of students studying maths

Several universities have dedicated Science communication units. These include the Universities of Surrey, Liverpool, University of the West of England, Bristol (UWE), University College London (UCL), Imperial, Bristol, Royal Holloway.

The Engineering and Physical Sciences Research Council and the Science and Technology Facilities Council also encourage public engagement and schools programmes.

The British Association for the Advancement of Science (BA) exists solely to advance the public understanding, accessibility and accountability of the sciences and engineering and organises an annual national science week and Festivals of Science.

From the HE sector over 100 universities engage in STEM outreach activities. These work with the primary, secondary, Further Education (FE) sectors and focus on curriculum enrichment with hands-on, whizz-bang activities. Their aim is to raise aspirations in science, to provide positive role models and of course have one eye on recruitment for the future.

Is it working?

Overall, there is a great deal of direct involvement between various agencies and school children associated with hands-on science activities. There is little evaluation of the long term impact of these activities but there is some evidence from the published research literature which should inform these activities.

In 2005 the Oxford, Cambridge and Royal Society of Arts Examinations Board (OCR) carried out a survey of 950 year 9, 10 and 11 students. They found that 50%+ students thought that science is boring, confusing, and difficult. 25%+ of the group indicated that they would not progress beyond GCSE. Experiments were the most popular activity followed by field trips. Reading textbooks and research on the internet were the least popular activities.

In 2002 a survey of 218 physics undergraduates (in Scotland) investigated the factors that affected the students' choice of discipline to study at university. It was found that 87% cited enjoyment of subject, 47% cited career opportunities, 27% cited the teacher and only 9% cited demonstrations, festivals, exhibitions and visits (Reid and Skryabina, 2002).

Research by Jarvis (2002) investigated the effects of a visit to a science centre or similar on the attitudes of pupils. It was found that positive attitudes following interventions only persist beyond a few weeks if pre- and post-activities are carried out by teachers in school.

Summary

There is no doubt that we need to switch more young people on to science. Research evidence clearly tells us that experiments are the most popular and most effective vehicle for achieving this. Research also indicates that it is what happens within the school curriculum that is most influential in determining children's attitudes. External efforts can enhance and enrich the curriculum but the school science curriculum and the teachers that deliver it are the only effective vehicle for changing attitudes in the long term. Therefore, we need more creative, enthusiastic, confident science teachers and we must create space, time, and facilities for more hands-on science in schools.

References

The Association for Science Education
http://www.ase.org.uk/

Science Learning Centres
http://www.sciencelearningcentres.org.uk/

Stem Support Centres
http://www.stemcentres.org.uk/

The British Association for the Advancement of Science
http://www.the-ba.net/the-ba/

EPSRC Public Engagement
http://www.epsrc.ac.uk/PublicEngagement/default.htm

STFC Public and Schools
http://www.scitech.ac.uk/PandS/Contents.aspx

Hands-on Science
http://www.handsonscience.org.uk/hands-on-science.html
http://www.hsci.info/

Chemistry for our Future
http://www.rsc.org/Education/CFOF/index.asp

Stimulating Physics
http://www.stimulatingphysics.org/

moremathsgrads
http://www.moremathsgrads.org.uk/home.cfm

Attitudes Towards Physics, N Reid and E Skryabina, *Research in Science and Technological Education*, 2002, **20**, 1 67 - 81

Effect of the challenger experience on elementary children's attitudes to science, T Jarvis and A Pell, *Journal of Research in Science Teaching*, 2002, **39**, 10, 979-1000.

Hands-On Science in Schools: The Enhancement & Enrichment Perspective

Dr Karen Bultitude
Science Communication Unit
University of the West of England, Bristol

Within the UK there are a remarkable range of programmes and activities on offer which seek to enhance and enrich student experience of science in school. Offered by a wide range of organisations, including universities, learned societies, museums, charities and private companies (both large and small), the impact of these programmes is arguably greatest when the students are most engaged – and one of the most effective ways to achieve that engagement is through hands-on learning.

This article will consider three separate case studies of successful Enhancement & Enrichment (E&E) initiatives. The purpose is to provide a snapshot of the range of activities that are available, as well as highlight key features which lead to success. Challenges associated with E&E activities are also discussed, and a range of exciting new developments in the field highlighted.

Case Study: RoboCupJunior

RoboCupJunior[1] (RCJ) is a project-oriented educational initiative that offers local, regional and international robotics events for school students. It provides a unique opportunity for participants with a wide variety of interests and strengths to work together as a team to achieve a common goal. RCJ offers several competitions, each emphasising both co-operative and task-achievement aspects:

In **RoboDance**, one or more robots perform to music, optionally accompanied by the students. This allows considerable scope for artistic creativity and is particularly appealing to girls.

In the **RoboRescue** challenge, robots race to identify 'victims' within simulated disaster scenarios.

The **RoboSoccer** game involves a dynamic environment in which teams of autonomous robots play on a greyscale pitch using an infrared emitting ball.

From the excitement and sheer enthusiasm of the teams involved there is no doubt that they enjoy the competition. However is it actually of benefit educationally? Petre & Price (2004)[2] are in no doubt of its effectiveness for 'back door' learning. They observed and interviewed teams at all levels of the competition, concluding that:

"…many of the children revealed that they had come to terms with topics (such as programming, gearing, and mathematical representations) which they had previously found difficult, in order to make the robot work. **That drive** *to build a functioning robot* ***had carried them into new*** *and sometimes daunting* ***territory****. It had helped them to take step-by-step and systematic approaches to* ***learning what they needed to know.****"*

The researchers also reported that learning encompassed an impressively broad range of skills, ranging from problem solving and planning to improvisation, learning from mistakes, teamwork, information sharing, interpersonal skills, and even patience. There is also evidence of this hands-on learning style appealing to a wider range of learning styles and educational needs.

Case Study: Awesome Athletes

The immersive learning approach which RoboCupJunior achieves through the incentive of a competition can also be accomplished in other ways. **Awesome Athletes**[3] is a programme of 'theme days' for primary children developed by the University of Nottingham, based around the topic of 'movement'. The programme encompasses a cross-curricular approach that stimulates engagement through problem solving, creative thinking and investigative learning. The delivery team work in close partnership with each school to develop a tailored programme that is fundamentally 'owned' by the school. The result is that the pupils' experience is directly linked to the world of R&D; teachers and children alike are excited and inspired by the idea of doing something similar to real research.

Feedback from schools has been outstanding; not only do the pupils enjoy the activities but there is clear evidence of both educational learning and improved attitudes towards science:

"The children enjoyed what they did and learned the best way, through hands-on experiments. Many commented that this was the most fun they had in science and wished it could be like this all the time!" – Parent Governor at Middleton Primary School.

"Do you know, I quite like being a scientist" – a normally unmotivated child from Lambley School

Perhaps the best outcome however, has been the evidence that a single theme day or workshop has changed the attitude and teaching practice of many teachers towards science and engineering.

"Encourages a more thematic, process-orientated. open-ended learning/teaching and working with cross age groups." – London teacher's workshop delegate

General feedback from teachers has indicated that the theme days provide an exciting and inspirational focus for the students, which has longer term benefits. For example, the children talk about the event weeks later, make reference to being a scientist themselves and make links with what they are doing in science class and what they did during the activity.

Case Study: Meet the Gene Machine

The first two exemplars built upon direct hands-on interventions, however there is also a wider implication of 'hands-on' that is worth considering, particularly in the case of older students. There is a great deal of evidence [4] to suggest that teenagers become more engaged with science when they are encouraged to consider – and actively debate – the social and ethical implications, rather than just the hard facts, leading to recent changes in the curriculum [5]. Meet the Gene Machine [6] is a current activity being delivered in schools by science centres throughout the UK. It aims to provide young people (aged 14+) with an opportunity to think about, discuss and debate relevant social, moral and ethical issues relating to genetic testing. In addition to the drama/debate with students it incorporates twilight Continuing Professional Development (CPD) sessions for teachers as well as a comprehensive pack of resources for teachers to use themselves within class.

To date the programme has reached over 9,000 pupils and over 380 teachers, and teacher reception of the project has been outstanding:

- 98.4% agreed that the activities within the discussion were useful
- 99.2% agreed that it was good use of students' time
- 100% agreed that they would involve students in a similar event again

Successes of Hands-On Science E&E

Comparison of the three case studies highlights certain key features which are critical to success:

- *interactive, participatory* – the 'hands-on' nature adds significantly to their success
- *cross-curricula approaches* – students and teachers alike are stimulated by activities which emphasise science in a broad context
- *clear curriculum links* – schools are finding it increasingly difficult to justify activities which are not clearly linked to the curriculum
- *building on existing networks and partnerships* – inspiration, relevance and coherency are best achieved through activities which combine specialist external expertise with internal teacher input, and take advantage of existing networks
- *sustainability and transfer of ownership* – the most effective way to reach as many students as possible is to embed the activity within a school; this is best achieved through developing teacher's skills and confidence to take ownership and adapt it to suit their own teaching

Challenges and Steps Forward

By the same token, certain issues do still remain which need to be accommodated:

- *teaching time is precious!* – Schools may not be in a position either financially or due to timetable constraints to release students for participation, or teachers for training. It is also often difficult for teachers to be able to identify where to source appropriate E&E activities; this is currently being addressed through the provision of the STEM Directories [7].
- *frequently reliant on volunteers* – Many providers of E&E activities do so on a voluntary basis, and often their E&E activities are unappreciated within their 'normal' jobs. In the long-term case of research staff in higher education this issue may be ameliorated with the advent of the Beacons for Public Engagement [8].
- *funding continuity* – It is rare to receive public engagement funding for more than two or three years, meaning that even very successful activities often have to close.
- *difficult to identify longer term impacts* – Partly due to the short-term funding structure, there are few longer-term studies of the impact of E&E activities on student subject selection and retention within the sciences.
- *audience reach* – Due to the nature of these activities they are often taken up by highly motivated teachers, which can mean that pupils in disadvantaged areas miss out. There are specific programmes to address this imbalance, eg Aim Higher [9] or the London Engineering Project [10].

Conclusion

It is not within the scope of this text to outline every current development within the field; however there are a wide variety of exciting initiatives. There is a phenomenal range of excellent Enhancement & Enrichment provision available within the UK, particular in the area of hands-on science. The challenge is to learn from previous key projects to ensure that students of the future receive the best possible experience in science.

Acknowledgements

The author wishes to acknowledge the contributions of Dr Donal McNally & Janice Yelland Sutcliffe (University of Nottingham); Ashley Green (Open University) and Laura Strieth (University of the West of England, Bristol).

1 www.robocupjunior.org

2 Petre, M. & Price, B. (2004). 'Using Robotics to Motivate 'Back Door' Learning'. *Education and Information Technologies*. 9:2, 147–158.

3 https://www.nottingham.ac.uk/active-communities/html/children_details/awesome_athletes.htm

4 http://www.scienceyear.com/sciteach/review/Findings.pdf

5 http://www.gcsechanges.com/gcses_are_changing.asp

6 http://www.scu.uwe.ac.uk/projects/events/meetthegenemachine.htm

7 http://www.stemdirectories.org.uk/

8 http://www.publicengagement.ac.uk/

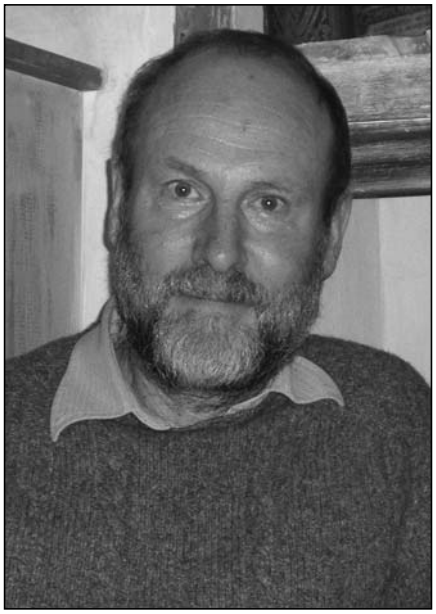
9 http://www.aimhigher.ac.uk/home/index.cfm

10 http://www.thelep.org.uk/

HANDS-ON SCIENCE IN SCHOOLS

Remote Experiments

Dr Hugh M Cartwright
Chemistry Department, Oxford University



Some people have a 'feel' for science. When they encounter a new problem in the physical world, they may know almost instantly how it could be solved, or at least have a hunch about what a solution would look like, even if they have never met it before. Using an ability to 'think outside the box', observation and theory can be linked in ways that others have not considered.

This sort of instinctive understanding is not as rare as one might imagine – many of the most productive scientists seem to possess it – and it is particularly valuable when scientific progress requires knowledge of more than one field. Medical imaging, biophysical chemistry and forensic archaeology are examples of applications in which research is facilitated by an understanding of at least two distinct fields.

If it is so valuable to be able to think about science intuitively, we should promote and nurture this ability among our young scientists; how might this be done? Science is inherently experimental, and an interest in science (or a lifelong hatred of it) generally develops in primary and early secondary school, when science teaching is frequently illustrated with experiment. If, through experiment, children can 'play around' with scientific ideas as they meet new concepts, they are more likely to acquire this feel for how the natural world behaves.

In the world of science fiction, eager science teachers unwrap modern equipment to illustrate and enliven each new topic as it is introduced. In real schools, equipment is limited in scope and quantity, is often well beyond its use-by date, and might have been inappropriate for its intended purpose even when purchased. Without the opportunity to engage in modern and interesting experiments, children come to regard science as lumps of theoretical gristle that seem to have little connection with reality.

Science theory and science experiment are part of the same fabric, so when children realize that to experiment is fun, their understanding of science will develop; in a proportion of students this will be accompanied by a growing science intuition. Experiment thus plays a crucial part in science teaching, but schools need access to appropriate equipment and if expense or other factors are barriers to the provision of suitable materials, alternative ways to run science experiments must be found.

One of the most promising approaches is to use the Internet.

At first, though the Internet was intriguing and novel, it was slow and one-dimensional. Its development into an interactive medium that children understand, enjoy and feel comfortable with has been dramatic. The web already permits sophisticated interaction between a user and a remote computer and it is a logical extension to arrange that a user, when they open a web browser, can connect not to a computer, but to a piece of equipment instead.

This is the realm of the remote experiment. A remote experiment is neither a simulation of an experiment, nor a storehouse of data from an experiment run by someone else, but a real experiment that can be run on real equipment. Accessible via the web, the physical location of the equipment is unimportant, so students anywhere in the UK might access equipment situated in Stockport or Toronto, Exeter or Mumbai.

Advantages of remote experiments

It might seem strange to propose one should run an experiment on equipment located thousands of miles away, but remote experiments offer many potential advantages:

The range of experiments available to students may be greatly increased: all that is required locally is a web-enabled computer and access to the Internet, opening a window on dozens or hundreds of experiments.

It may be possible to access equipment that could never be provided locally: no school could expect to be able to use an electron microscope in the school laboratory, or get time on a geostationary satellite, but these might be available through the web.

Experiments can be run at any time: an experiment does not become inaccessible just because the school laboratory has closed its doors. Learning can extend past the end of class into the lunch hour or after school; students can continue to do experiments and learn at home.

An experiment run through the Internet may not seem like science: this is a crucial advantage. Science has a modest public relations image compared to more sexy topics such as media studies; school

science teachers may struggle to make science seem 'cool'. Science experiments conducted through the internet can be fun though; indeed students may not think of such experiments as science at all, so the stigma of being identified as a geek who enjoys science, present in some schools, evaporates.

Collaborative experiments that involve students from different classes and schools, even on different continents, become possible: collaboration among students and institutions in different countries is a major aim of EU education support, so this provides a possible mechanism to fund the development and promotion of Internet-based experiments.

Remote experiments show particular promise in third-world countries: in such countries computers are often cheap and surprisingly widespread in the education system. By contrast, scientific equipment is expensive and therefore a low priority in the school budget. Where the science education of students is book-based, not experiment-based, remote experiments can fill the gap by offering a range of relevant activities.

Remote experiments can support in-service teacher training: many science teachers teach a topic outside their primary area of expertise. Remote experiments offer an opportunity for them to study in greater depth techniques such as nuclear magnetic resonance, which they may include in their lessons, but of which they have only limited first-hand experience.

Challenges in developing remote experiments

If remote experiments have so much to recommend them, surely the Internet should be awash with them? The advantages mentioned above have not been overstated, but significant challenges do exist.

The start-up cost of any experiment must be met: costs fall upon the initial developer of the experiment and may be too great for a school to absorb if it would like to place an experiment on the web.

Commercial software for connecting instruments to the web is generally difficult to use and may be vulnerable to security attacks: there is a need to develop simpler, secure software.

Those placing equipment on the web need an understanding both of computing and of science: programming skills are required to interface equipment with the web, while an appreciation of science is needed so that experiments are scientifically accurate and are not mere entertainment.

So what should be done?

A sound understanding of science encompasses both theory and its application. The truly hands-on experience, when the student performs an experiment locally, is almost always preferable to a remote experiment. But where the Internet can be used to expand the curriculum and provide opportunities for students that would not otherwise be available, it should be used. We should aim to produce a range of experiments through which children can enhance their understanding and enjoyment of science. Remote experiments, just like those performed locally, should be fun, so that, in enhancing their scientific knowledge, children also discover the excitement of science.

An opportunity exists for the UK to take the lead in this emerging area. A small number of school, university, or museum-based centres should be funded to offer remote experiments. Serving the needs of children across a range of ages, these experiments should be sufficiently unusual, expensive, or hard to set up that they would not normally be found in the school laboratory. They should be designed with the needs not only of students in the UK in mind but also those in less advanced countries. Finally, software should be developed that is sufficiently simple and robust that it can be used by a teacher with only an average understanding of computing to connect local equipment to the Internet.

This is one of those rare areas in education in which the potential is great, but the field is only just opening up (and the dead hand of government regulation has yet to weigh down). Substantial gains in our children's understanding of science are possible through the promotion of Internet-based experiments; we should grasp the opportunity.

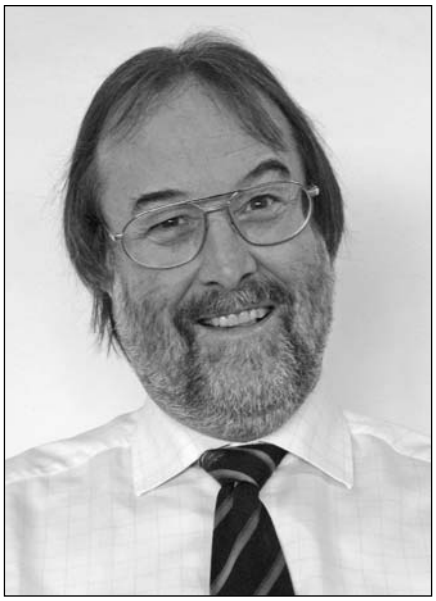
The following points were raised during discussion:

The schools telescope project is grossly underestimated; six schools use it, but there is no follow-up research concerning its effectiveness on young people. The Science Museum has experimental data on the impact of science learning on children and a website with a large number of visitors and deals with children and adults together. Access to mobile and properly resourced science teaching can be provided through 'lab on a lorry'. Many of the examples of work presented were teaching people how to be project managers rather than scientists. Unfortunately a lot of science is no longer hands-on science in schools for safety reasons which cannot be avoided. However, it is important that students have the opportunity to do things in school which are somewhat dangerous so that they learn to evaluate risk. The effect of safety legislation has been to take out the more dangerous aspects of school science which is a pity. Tracking the benefits of primary school training through to secondary school outcomes is a ten-year project and funding councils will only fund a three-year project. Major government support is required although many projects are locally based and are designed to support teachers who also need inspiration. For most scientists, curiosity is an insatiable driving need which inspires their work. Projects like Awesome Athletes can really stimulate that sort of curiosity. It shows directly that asking questions and finding out the answers is fun, interesting and important. Creativity, in terms of approach and application, can give children freedom to explore and the confidence to realise that there isn't a single right answer.

Chemicals in Food, Water and Consumer Products

Professor David Coggon

Professor of Occupational and Environmental Medicine, MRC Epidemiology Resource Centre, University of Southampton and Chairman of Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment



Over the past 50 years, life expectancy in the UK has increased substantially, and we now enjoy longer and healthier lives than ever before. This benefit has been achieved principally through advances in science and technology, including the discovery and wide-ranging exploitation of large numbers of new chemicals. However, while the net effect of technological progress has been positive, there are notable examples of harm to human health and wildlife from chemicals that have been introduced into our food or environment, either deliberately (eg asbestos, organochlorine insecticides) or inadvertently as by-products of new technology (eg motor vehicle exhaust). In looking to the future, therefore, our challenge is to maximise the benefits from technological advances while minimising adverse effects. This objective is pursued through appropriate risk management.

The starting point when managing risks from chemicals is a scientific assessment of risk, which entails three main steps:

- Hazard identification – what are the potential adverse effects of the chemical?
- Hazard characterisation – how does the probability and severity of these hazards relate to the circumstances and level of exposure to the chemical?
- Characterisation of risk – given the expected circumstances and levels of exposures to the chemical, what harm can be expected?

It should be noted that the risks from chemicals depend importantly on the circumstances and extent of exposure. Handling an intact lump of asbestos poses no material risk to health, whereas inhalation of microscopic asbestos fibres can cause serious lung disease, the probability of disease varying according to the cumulative amount of asbestos inhaled over time. Exposure to uranium provides another example. We are all exposed daily to tiny quantities of uranium in the water that we drink, but this is not of concern because the risks from such low levels of exposure are negligible.

Various sources of information may contribute to risk assessment for chemicals, including:

- Knowledge of chemical structures – for example, some molecular features make it more likely that a substance will bind to the DNA in cells, possibly causing cancer
- Experiments in vitro – for example, tests for mutagenicity (ability to damage DNA) in bacteria
- Experiments in laboratory animals
- Case reports and epidemiological studies of exposed humans and wildlife
- Experimental studies in humans (where these are judged ethically acceptable)
- Studies to assess levels of chemicals in food, water, air, soil and other environmental media
- Studies to assess the extent to which people or wildlife are exposed to chemicals from different sources and by different pathways

However, even where extensive scientific data are available, there will always be an element of uncertainty in the assessment of risk. Uncertainty can arise because few relevant studies have been conducted; because available studies are imperfect in their design or execution, and liable to statistical error because of their limited size; and in the extrapolation from findings in vitro and in laboratory animals to human exposures. As would be expected, such uncertainty tends to be greater for new chemicals than for those that have been present in the food or environment for many years.

Risk assessment therefore requires not only an estimate of the possible risks from a chemical, but also consideration of the uncertainty in risk estimates. In the communication of risk assessments it helps to distinguish between risk and uncertainty. The

presence of a risk implies that a proportion of exposed people (or animals) will suffer harm as consequence of their exposure. However, uncertainty often extends to a scenario in which there is no elevation of risk whatsoever. For example, currently available evidence does not indicate a risk of hip fracture from fluoridation of drinking water, but there is some uncertainty. While our best estimate is that there is no risk, we cannot exclude the possibility that a small risk has been missed by the research conducted to date.

Risk management builds on risk assessment by comparing estimates of the risks, benefits and costs, and of the attendant uncertainties, for each of several options (eg whether or not to permit the use of a chemical in a particular way), and choosing the one that is considered preferable. This entails the application of value judgements. For example, some people worry more about the uncertain risks of fluoridation than others. Thus, while risk assessment is a scientific activity, risk management is not. Where the choices under consideration affect only one person, risk management is ideally devolved to the individual concerned, who can then apply his or her own values in deciding what to do. However, where multiple stakeholders are affected by a decision, the weighing of risks, benefits, costs and uncertainties becomes a political activity.

The Committee on Toxicity

The Committee on Toxicity provides independent scientific advice to Government and to the public on the assessment of risks from chemicals in food, consumer products and the environment. It currently comprises a chairman and 14 scientific members, mostly from academia, who are appointed on merit (according to the rules of the Commissioner for Public Appointments) on the basis of their expertise in relevant areas of science and medicine. In addition, two 'lay members' bring a broader perspective to its deliberations and communications. The secretariat is provided jointly by the Food Standards Agency (FSA) and the Health Protection Agency. Its work is co-ordinated with that of two sister committees – the Committee on Carcinogenicity and the Committee on Mutagenicity.

The Committee considers questions, most of which are referred to it by its two sponsoring departments, FSA and DH, or (less frequently) by other Government departments and advisory committees. In addition, the Committee carries out its own horizon-scanning, and may identify other topics which it feels should be addressed. Its main outputs are published statements in which it draws conclusions and makes recommendations on the questions that it has considered. Additionally, the chairman (with or without other members) may attend meetings with departmental bodies (eg the FSA Board) to discuss findings, and the publication of statements may be accompanied by press releases or press conferences. The Committee endeavours to be as open as possible in its business, making its meetings open to the public and publishing minutes on its website. Exceptions may occur (eg because a scientific paper under discussion is still under consideration for publication in a scientific journal), but in these circumstances, full minutes are published once the original obstacle has been removed.

Examples of topics on which the Committee has recently issued statements, or which currently are under consideration, include:

- Effects of mixtures of food colours and a preservative on behaviour in children
- Ill-health in commercial air crew and the cabin air environment
- Use of PAVA as an incapacitant spray
- Reproductive effects of caffeine
- Reproductive outcomes in people living near landfill sites
- The Lowermoor water pollution incident
- Possible risks from plant toxins in honey
- Air fresheners
- Chlorination disinfection by-products in drinking water
- Safety of milk and meat from animals that have eaten bracken

It should be noted that the work of the Committee is not restricted to man-made chemicals, and that several of the investigations listed above concern naturally occurring substances. This underlines the important message that natural does not imply safe. Many of the most toxic chemicals (eg ricin, aflatoxin) occur naturally, while many synthetic chemicals have very low toxicity.

Future needs

One of the threats to the future of chemical risk assessment in the UK is a possible shortage of scientists with the relevant expertise in areas such as toxicology, epidemiology and exposure assessment. Applied sciences of this type have tended to fare less well in university research assessment exercises, in part because their output is seen as less innovative and exciting. And perhaps for the same reason, it has become more difficult to attract high quality graduates into these fields. The Medical Research Council has recently embarked on an initiative to expand training in toxicology, but other diciplines also need to be re-invigorated.

Meanwhile, resources for risk assessment must be managed with care. Substantial input is needed for chemicals that intrinsically are more hazardous (eg pesticides and medicines), and for new products to which exposure will be extensive. For others, a lighter touch is more appropriate.

The role of the Pesticides Safety Directorate in regulating Pesticides and Detergents

Dr Kerr Wilson
Chief Executive, Pesticides Safety Directorate

The Pesticides Safety Directorate (PSD) is the UK Regulatory Authority for pesticides and detergents. On 1 April 2008 PSD transferred to the Health and Safety Executive (HSE). Prior to the move to HSE, PSD was an Executive Agency of Department for Environment Food and Rural Affairs (Defra). PSD reports on operational matters to HSE and to Defra Ministers and to four other Departments on pesticide and detergents policy issues. Pesticides and detergents are regulated at both European and national level.

Detergents

Detergents legislation is primarily set to protect the environment. Companies wishing to manufacture and sell detergents must be able to demonstrate that the active ingredient (surfactant) meets the required standard of biodegradation. Companies are not required to submit their test results to PSD but must provide the data if asked to do so. In exceptional circumstances, where the surfactant does not meet the required standard, companies can apply to the regulatory authority for a derogation.

Pesticides

In contrast to the detergent regime, pesticides are heavily regulated and this relies on a scientific assessment of the risk. The scientific data required to get an approval to supply and use a pesticide is extensive and thorough and undergoes intensive scrutiny by PSD and other bodies. Pesticides, in common with other chemicals, are used to benefit society but because of their toxic properties and the way they are used they have to be carefully assessed and regulated to minimise harm to both people and the environment.

The active ingredients in pesticide products are regulated at European level. Getting an active compound on the approved European list involves submitting a detailed scientific dossier. The dossier is evaluated by a selected national regulator and further scrutinised by other Member State regulators. The European Food Safety Authority's independent experts advise the European Commission before Member States vote on whether to list the active ingredient.

Products (containing the listed actives) are approved at national level. Companies wishing to sell products in the UK submit a data package to PSD. No pesticide can be supplied or used without approval. For approval to be granted a company must be able to demonstrate that the product is efficacious and that risk to human health, the environment and wildlife is minimal. Post approval monitoring is in place to ensure the controls are working and to identify any emerging adverse effects.

Pesticides in food

The protection of the public is a key consideration for PSD and other regulators such as the Food Standards Agency, particularly in relation to residues in food. The PSD consumer risk assessments follow internationally agreed scientific protocols for toxicological studies and crop residue studies. When assessing the consumer risk both chronic and acute exposures are applied to a range of ten different people categories. The results from residue trials identify the highest residues from proper use and these data are used to calculate the potential consumer intake. Approvals are granted only if the predicted exposure is less than the health-based reference dose. Taking an example pesticide, the Acceptable Daily Intake for Kresoxim Methyl is 0.4mg/kg whereas the calculated consumer exposure is 0.0012mg/kg.

Residues on produce are controlled using the concept of the Maximum Residue Level (MRL). This is a limit based on the residues likely to be found on produce following good agricultural practice. It is a trading standard and not a health-based standard. Produce which has residues above the MRL must not be sold. The limits set for MRLs are often significantly lower than would give rise to intakes near to health based reference doses. From September 2008 the default MRL for all residues will be 0.01mg/kg (effectively zero in analytical terms) unless specific data are provided to support higher values.

As part of our post-approval monitoring we sample food for pesticide residues at a cost of about £2m pa. About 98% of samples are generally found to have residues below the MRL. Produce that repeatedly shows up with MRL exceedences is subject to special attention by PSD. For example, some years ago testing revealed residue levels in lettuce. PSD's advice to growers and other interventions has effectively driven down residue levels.

The Committee on Toxicity published a report on the risk assessment of

mixtures of pesticides and suggested that a methodology should be developed for cumulative risk assessment. PSD is supporting the European Food Safety Authority in developing an approach for assessing cumulative risk.

Pesticides in water

Protection of water courses from pesticides is an important aspect of PSD's work. The standard we are working to is to ensure any pesticide residue in drinking water is less than 0.1µg/litre. Pesticides which are sprayed on crops may drift into water courses or leach through the soil into ground water. Point sources of contamination can be major contributors to pollution. PSD has been active in commissioning R&D into possible sources of contamination, particularly field drains and point sources. Research has shown that contamination to water from sprayers at the end of an operation is significant and the use of bio-beds can reduce contamination significantly. Even the washings from a single pair of gloves can contaminate a water ditch 100m x1m x 1m to a level in excess of the 0.1µg/litre limit. PSD validated models are used to predict the likelihood of concentrations exceeding 0.1 limit in a range of vulnerable soil and climate scenarios.

PSD works closely with the Environment Agency who has an extensive surface and groundwater monitoring programme throughout England and Wales. Out of nine commonly detected pesticides, two have been withdrawn and two will be phased out by 2009. The remainder will be reviewed when they appear for re-registration.

Current issues

The availability (or non-availability) of pesticides is moving up the political agenda because of concerns over food supply and food security. The issue of pesticide availability has come about largely as a result of the European Review of pesticides. A large number of pesticides have been taken off the market some for safety and some for commercial reasons. Approximately 60% of pesticides have been removed from the approved list. Existing legislation and proposed new European legislation will inevitably have further implications for pesticide availability.

The UK is an active participant in the European negotiations on proposed new pesticide legislation and a Sustainable Use Directive and we are well ahead in having developed our own national strategy. The UK strategy covers five areas – human health, water, biodiversity, amenity use and availability. Working groups drawn from a wide group of stakeholders are taking these workstreams forward.

Finally, the move of PSD into HSE will put chemical regulation into one single body. Over the next year PSD will be working with colleagues engaged on biocides and chemicals (REACH) regulation to share best practice and to explore how we can make best use of our combined expertise. Maintaining our internationally respected UK regulatory science expertise will be essential if we are to play our part protecting people and the environment whilst recognising the benefits that modern technology can bring to society and the economy.

CHEMICALS IN FOOD, WATER AND CONSUMER PRODUCTS

Why should we be concerned about our exposure to chemicals?

Gwynne Lyons
CHEM Trust [1]

There is insufficient information available on the toxicity of many industrial chemicals on the market today to undertake even a basic assessment of the risks they pose to human health and the environment. Therefore, to some extent, protection of the public is based on wishful thinking rather than good science. Yet the stakes are high, because there is ubiquitous exposure to many of these chemicals from their extensive use in consumer products, and from air, water or food contamination.

Of course, not all chemicals are bad, but there are mounting concerns about those which have endocrine disrupting properties. Such chemicals can mimic or de-rail the normal functioning of hormones, which are the body's own chemical messengers.

Over the last decade, in response to the mounting worry about possible widespread effects, the European Commission has spent a total of €161m (around £125m) on research into endocrine disruption. Many excellent UK scientists are contributing to world class research in this area.

The main concerns that have been identified include reproductive

1 CHEM (Chemicals, Health and Environment Monitoring) Trust is a new charity set up with initial funding from WWF-UK, with a mission to protect wildlife and humans from harmful chemicals.

disorders in men (including declining sperm quality and quantity, and defects in baby boys' genitalia), and increases in breast and testis cancer. The rate of increase in cancers of the breast and testis is such that it cannot solely be due to genetic factors. Some environmental factor(s) (which could include life-style) are also at play, because genes in a population just don't change that quickly.

Hormonal action is key to the origin or progression of these disorders, and so it is likely that hormone disrupting chemicals are involved. The suspicion that certain chemicals play a role is underpinned by information from in-vitro studies and animal experiments. Indeed, some scientists point out that the 'phthalate syndrome' which is a group of symptoms (including un-descended testes, shortened ano-genital distance, and reduced sperm counts) caused by de-masculinization of laboratory animals by phthalates, is remarkably similar to many of the problems which now seem to be increasing in men. Phthalates have many uses, particularly in plastics, and some have well known anti-androgenic properties. However, proving which chemicals are causing effects in humans is problematic. Many interacting influences may play a part, and it is generally only possible to uncover the role of a particular chemical when it exerts, by itself, a very strong impact on the disease process. Some epidemiological studies are, however, adding to the weight of evidence. For example, a US study found baby boys with shorter ano-genital distance and impaired testicular descent (both markers of de-masculinization) were born to mothers with higher exposure to certain phthalates during pregnancy.

Similarly, with regard to breast cancer, it is suspected that oestrogen mimicking chemicals may be involved, as it is well established that factors which increase a woman's lifetime oestrogen exposure, increase her risk of breast cancer. Now, studies in women exposed to oestrogenic pesticides are backing up that concern. For example, a study in Spain has found an increased breast cancer risk in some women with higher total exposure to several oestrogen mimicking pesticides measured as the total effective man-made oestrogenic burden.

Hormone disrupting chemicals found in consumer products

People can be simultaneously exposed to large numbers of hormone disrupting chemicals. Chemicals with endocrine or hormone disrupting properties are found in a vast array of consumer products. A few notable ones include:

some phthalates used to make plastics flexible;

certain parabens, such as butyl paraben, an antioxidant used in some cosmetics;

benzophenone and 4-methyl-benzylidene camphor, UV filters used in sun-screens;

bisphenol A, which can leach from polycarbonate and from the epoxy resin lining used on the inside of food tins.

some brominated compounds used as flame retardants.

Pesticides with hormone disrupting properties

Moreover, many endocrine disrupting pesticides, even those long since banned in the EU, can still be found as food contaminants, either because of illegal usage, or due to their environmental persistence, or because they are still used on imported products grown outside of the EU.

There is much more information on the toxic properties of pesticides as compared to many other chemicals, and the active ingredients used in the EU have been subject to review. Thus, some pesticides with hormone disrupting properties, such as the vinclozolin and atrazine (where the concern was groundwater pollution) are now no longer permitted. Others such as procymidone (used, for example, on plums and cucumbers) and fenarimol (used on tomatoes, peppers, melons, aubergines etc) are still allowed, although due to be removed from the authorised list after June 2008. Nevertheless, vinclozolin, procymidone and fenarimol, all of which have anti-androgenic properties, can still be used outside the EU and can be found as residues in imported produce.

Currently, the EU plant protection products legislation is being updated and negotiations are ongoing. The proposed text of this new legislation could lead to EU usage of other endocrine disrupting pesticides being prohibited unless human exposure is negligible. However, the final wording of the legislation, and how it will be implemented has yet to be seen.

Need for better test methods and improved methods of assessment

Many pollutants now recognised as hormone disruptors, such as TBT and certain phthalates, were only identified through scientific studies, not by routine safety testing. There is therefore a need to develop novel, regulatory test methods, and to implement the best available test methods in legislative frameworks, and to subject the test methods used to regular review.

Few chemicals have been adequately investigated using even the test methods available now, which are sufficient to identify at least some chemicals with endocrine disrupting properties.

Furthermore, even when some information is available, the current methods of assessing a chemical's safety may not be suitable for assessing hormone disrupting chemicals. In particular the assumption of a threshold may not be tenable because these chemicals act together with natural hormones already present. Even small amounts of hormone disrupting chemicals may therefore add to the overall effects, and moreover, it is likely that due to the limited sensitivity of established test methods, such effects are overlooked.

In addition, at the nub of much of the concern is the knowledge that we are now exposed to many hormone disrupting chemicals, which are known to be able to act additively. Experiments have shown that several oestrogen mimicking chemicals can cause effects, even when each is below its individual threshold for effect. Anti-androgenic chemicals and thyroid disrupting chemicals have also been shown to have additive effects. There have been some attempts to get to grips with concurrent exposures and the cocktail effect, and notable is the UK Committee on Toxicity's Working Group on Risk Assessment of Mixtures of Pesticides. Unfortunately, this has not led to adequate policy reform to address the issue, which needs to be dealt with in EU-wide guidance. For example, an oestrogen mimicking chemical, such as bisphenol A, is

assessed by itself, with no due regard to the knowledge that many other chemicals have similar mechanisms of action.

Expert interpretation of the science highlights the need for action

Networks of excellence, international conferences, and years of painstaking research have enabled many scientists in this field to develop a broad understanding of endocrine disruption and the effects of chemicals with such properties. Concerned about what the science was telling them, in 2005, hundreds of scientists working at the cutting edge of research into endocrine disruption signed the Prague Declaration. In this Declaration, scientists outlined what they had found, gave their interpretation of the science, and made some recommendations. They noted that while causality was well established for detrimental effects in wildlife, there were inherent difficulties in establishing causal links in humans. Furthermore, they concluded:

"In view of the magnitude of the potential risks associated with endocrine disrupters, we strongly believe that scientific uncertainty should not delay precautionary action on reducing the exposures to and the risks from endocrine disrupters."

Anyone concerned about public health might like to read the full seven-page Prague Declaration, which is available at the following web site: http://www.ehponline.org/docs/2007/10517/suppl.pdf

The Declaration went beyond the concerns about male reproductive health and hormone related cancers, and highlighted the in-utero susceptibility of the immune system to certain pollutants. It also flagged potential effects on brain development and brain ageing, as scientists conjectured that problems could be expected based on their knowledge of thyroid hormone physiology. The need for further investigation of the role of hormone disrupting chemicals in obesity and stress related disorders were similarly noted.

There is an important role for politicians

Expert judgement is therefore that there is a need to reduce exposures to hormone disrupting chemicals where possible, but it will take political will in many EU countries to take that forward on all fronts. To this end, CHEM Trust has written to selected Member States, including UK representatives, urging them to draft dossiers to put some chemicals with hormone disrupting properties onto the candidate list for prior authorisation under REACH (the new EU Chemicals Regulation concerning the Evaluation, Authorisation and Restriction of Chemicals). This would subject these non-pesticide hormone disrupting chemicals to much stricter controls, and would stimulate the use of safer alternatives.

It is sometimes difficult to gain consensus amongst the EU's 27 Member States, and controls over chemicals can be thwarted by a powerful industry lobby. However, with some political leadership from the UK, and with policies based on good science and expert interpretation of that science, there may be just a chance of preventing much future suffering.

The following points were raised during discussion:

Testicular cancer is certainly on the increase. However mortality statistics have been increasing since the 1930s. Hence causative factors must have been established as early as 1910. The later appearance of endocrine disruptors does not appear to account fully for the overall increase in this disease. Regarding breast cancer the role of increased oestrogen exposure is certainly correct. Regarding trends for breast cancer, other factors also need to be taken into account such as the effect of a delay in the timing of the first pregnancy, and the effect of screening which increases incidence.

Mixtures or combined exposures to chemicals are widely raised and a report is in preparation by COT. Interactions or the joint effects of two chemicals may generate a combined exposure effect which may amount to more than an additive effect.

What was the level of maternal smoking in 1910? Was this an important factor in testicular cancer in 1910? Why is multiple sclerosis in Orkney and Shetland twice as high as it is in the south of England? Is it related to latitude? Is the falling sperm count in men and gynaecomastia (breast development) in young boys, which is now a major problem, related to oral contraceptive in the water supply? Are organo-phosphate pesticides responsible for neurological damage now totally off the market?

Chemicals certainly do not account for all the evidence as with multifactorial disease it is difficult to evaluate the full weight of evidence. One can only speculate that polyaromatic hydrocarbons (PAHs) were around in the early part of the 20th century and they are endocrine disruptors. The data from epidemiological studies and those on animals need to be combined to understand the processes involved. The roles of asbestos and tobacco can be difficult to identify and the problems become much more difficult when many chemicals are involved. Hence the importance of the Prague Declaration calling for reduction in exposure to chemicals which come from a multiplicity of sources often from objects in everyday use. The possible relationship between low levels of oestrogen in water and men with mammary tissue is a hypothesis requiring further work.

The impression has been created that the REACH programme is not doing what it was intended to do or it is not stringent enough and that regulation is not working. Implementation of REACH is now under the control of the 27 member states. Regulation should be based on the full range of evidence and on risk, not on hazard and there are uncertainties in the science. The highest risk generation of men at risk from smoking and lung cancer were born in 1905 and for women those born in 1925 so smoking does not relate to testicular cancer rates. Multiple sclerosis is latitude related and is an effect in early life, possibly due to infection by epstein barr virus. Risk analysis on multiple chemicals is difficult to estimate due to the additive effect. Hence hazard may sometimes be the only useful guide to risk. If we regulate on hazard we need to find out if there is a benefit to be gained which outweighs disadvantages and balances risk. The Precautionary Principle is a general rule relating to uncertainty in risk and politicians wish to make sure they have set up institutional arrangements which provide a mechanism for managing risk in a well informed manner.

The Introduction of Biosimilar Medicines

Dr Antonio Pagliuca
Kings College Hospital, London

There are currently more than 150 biotechnology medicines on the market. Over 325 million patients worldwide use biotech medicines and 50% of medicines in clinical development are biotech medicines. The first biotechnology medicines have now reached, or are approaching, the end of their patent life, providing an opportunity for products which are similar to the original product to be produced. In the past 12 months, an additional 5 biosimilar medicines have been introduced onto the UK market.

There are significant differences between the biotechnology and chemical medicines. Biotech medicines are made from living cells, whereas chemical medicines are made from a chemical process meaning that biotech medicines are more complex proteins. Additionally, biotech medicines contain a mixture of related molecules which are more difficult to characterise than chemical medicines, which have a simple and well-defined structure. In addition, biosimilar medicines are made with a different cell-line and a different manufacturing and purification process from the originator product. The different manufacturing processes lead to similar, but not identical, biophysical characteristics.

In the debate surrounding the introduction of 'biosimilars', some manufacturers of biosimilars would rather they were referred to as 'biogenerics', as if to suggest they were a usual generic product. Generally, there is no issue with the substitution of generics; however, as the European regulatory body the European Medicines Agency (EMEA) recognise, due to the complexity of biological or biotechnology-derived products, the generic approach is scientifically not appropriate for these products. The EMEA, and the UK regulatory body, the Medicines and Healthcare products Regulatory Agency (MHRA), both classify follow-on biological medicinal products as 'biosimilars'.

In considering the introduction of biosimilars there are four distinct areas that need to be carefully considered by government and regulators. These are: 1) the molecular properties: as described above, biotech medicines are more complex than chemical medicines; 2) the manufacturing process which is extremely sensitive to changes in manufacturing or production – minor variations could produce vastly different products; 3) safety aspects: the long term safety profile of biosimilars needs to be established, which needs to be brought to the attention of prescribers and patients; and 4) the efficacy of the medicine, which can differ significantly with small changes in protein biophysical characteristics or in formulation of the drug product.

The EMEA has introduced a guideline on Similar Biological Medicinal Products, which seeks to consider these four areas and sets an overarching 'umbrella' guideline on the approach to bringing biosimilar products to market. This guideline indicates that biosimilar manufacturers need to identify a single reference product and conduct tests to demonstrate biophysical similarity and accepts that "it is not expected that the quality attributes … will be identical"[1] to the reference product. There is currently an EMEA requirement to provide non-clinical and clinical data to demonstrate clinical similarity to the reference product, however; surrogate endpoints[2] may be used to show similar clinical characteristics only if the endpoint is appropriately validated. If this cannot be validated, an efficacy study in an appropriate indication is required.

If the reference product has multiple therapeutic indications, the biosimilar manufacturer may extrapolate from other indications if the mechanism of action is the same and if appropriately justified. The guidance requires immunogenicity data to be provided before approval, and product-specific annexes provide details for erythropoietin, granulocyte colony stimulating factor, insulin and growth hormone. It is important that healthcare practitioners are aware this data is extrapolated from other indications when choosing which product to prescribe.

To ensure safety within this framework, pharmacovigilance systems need to be robust enough to cope with the introduction of biosimilars. This means they need to ensure traceability. Therefore, company and regulatory agency (in the UK the MHRA) pharmacovigilance reporting systems should distinguish one manufacturer's product from another. If biosimilars have the same International Non-proprietary Name (INN) as the originator product, it is even more important that pharmacovigilance systems are strictly enforced. To prevent repeated uncontrolled substitution, biosimilars should be prescribed by brand name alone with a strict ban on substitution.

In addition to these precautions, there are many simple ways in which inadvertent substitution of biosimilars can be prevented, including making physicians, pharmacists and patients

aware of the data available to support a medicine; making Patient Information Leaflets (PILs) transparent and clear; providing a defined reference product; describing clinical data for approval including unique safety data and offering substitution advice.

Biotechnology medicines are a welcome part of the future healthcare landscape and will become a familiar phenomenon. A regulatory approval process has been established in Europe and both the MHRA and the Government have committed to a robust pharmacovigilance system whilst we continue to learn more about biosimilar medicines; however, awareness of the differences between original biotech medicines and biosimilars is essential for healthcare professionals and patients to ensure appropriate introduction into clinical practice.

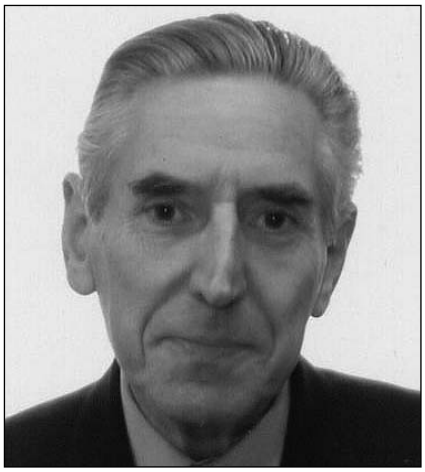
1 EMEA Guideline on Similar Biological Medicinal Products Containing Biotechnology-derived proteins as Active Substance: Quality Issues. 22 February 2006, London . EMEA/CHMP/BWP/49348/2005 http://www.emea.europa.eu/pdfs/human/biosimilar/4934805en.pdf

2 Outcome measures that are not of direct practical importance but are believed to reflect outcomes that are important are called surrogate outcomes.

SAFETY ISSUES RELATED TO THE INTRODUCTION OF BIOSIMILAR MEDICINES INTO UK HEALTHCARE

Biosimilars and Patient issues

Michael Summers
Vice Chairman, The Patients Association



The Patients Association is a national charity providing patients with an opportunity to raise concerns and share experiences of healthcare. We are committed to making a difference to the 'Patient Journey', educating our members, patients, healthcare practitioners and politicians about the key issues affecting patients, including advances in technology and the impact this will have on patients.

As part of this representation, we feel the introduction of biosimilar medicines to patient care in the UK raises important issues for patients and patients' organisations. The significant advance in available treatments necessitates caution during their introduction until all participants are fully familiar with these products.

Whilst safe and effective biosimilars have the potential to play a role in stimulating competition, and broadening treatment options for patients, it remains important for doctors and patients to recognise that biosimilars are not directly substitutable in the same way that traditional generic medicines are substituted for chemical medicines. Biosimilars may bring benefits to patients, including lower cost to the NHS; however, it is not yet known how significant the cost savings will be compared with originator medicines but it seems the differences are unlikely to be as great as those seen with generics of chemical medicines.

Due to current gaps in knowledge, there have been a number of movements by patient organisations to improve patient understanding of treatment with biotechnology, and biosimilar, medicines. The National Patient Safety Association has launched a 'Please Ask' campaign encouraging patients to ask about their treatment and discuss options with healthcare staff. Meanwhile, the International Alliance of Patients' Organisations (IAPO) has launched an educational programme on biosimilar medicines to help patient organisations make informed judgements on their value and the scientific, social, ethical and economic issues.

A patient survey conducted by IAPO in 2006 showed that whilst patients were concerned by the cost of medicines, their main concerns related to efficacy and safety. Whilst there was a positive interest in biosimilars, all patient groups called for biosimilars to be introduced in a safe and appropriate way. This was summed up by Charles Gore, President of the European Liver Patients' Association who said *"Biosimilars offer a tremendous opportunity to reduce medicinal costs but offer equally important challenges – they must offer true comparability with the original products because ultimately safety comes first. We do not want to give ourselves a dangerous legacy"*. In addition, this survey indicated there should be a risk assessment of labelling and packaging of dispensed medicines to minimise harm from 'look-alike' products.[1]

Low levels of awareness of biosimilar medicines hinders the role of patients, and patient groups, in engaging in this debate. In turn, this restricts patient knowledge in discussing health needs with their healthcare providers. Where biosimilars are available, patients must understand the choice they are making and be involved in that choice. Transparent and clear information and involvement of patients in policy debates is essential to build trust in new medicines.

The importance of easy tracing and clear indications of side-effects will be essential to patient safety in the event of adverse drug reactions (ADR). The

patient has an important role, and responsibility, in this. To help patients, medicines must be clearly marked, easily identifiable and well labelled to enable tracing in the event of an ADR. Clear educational material will be essential and healthcare staff have a key role to play in making sure patients are aware of any associated risks. They must understand both the positive and negative side-effects of any treatment, ie patients need to be 'risk-literate', so they understand the actual risks associated with a treatment, in realistic terms. There is a responsibility on all participants in the health agenda to make sure this information is conveyed in the clearest and most effective way.

The Government and health regulatory bodies need to take all necessary actions to protect patient safety during the introduction of biosimilars. This should include:

- A programme that ensures clinicians are aware of the possible risks and that these should be fully discussed with patients.
- Many more biotechnology products are due to come on to the market in the coming years. Patients should be made aware of the difference between traditional medicines and biotechnology medicines.
- Patients should be made aware of their role in ensuring full pharmacovigilance with any new medicines. They should also understand why it is important that they report adverse reactions and how these should be reported.

1 Biosimilar Medicines, The Views and Roles of Patients and Patients' Organisations, Jo Harkness, International Alliance of Patients Organisations, 4th EGA symposium on Biosimilar Medicines, 19 May 2006, London, UK

The following points were raised during discussion:

This is an awareness session following on from the Panel discussion and a recent Adjournment Debate designed to draw attention to the potential danger inherent in the use of powerful, largely protein based drugs, which differ from generic drugs in their inherent variability among several other factors.

Is there possibility of regulatory creep in relation to a defined reference point? The greatest danger arises from confusion. An example was then presented where two cancer patients died very rapidly. They were receiving an antifungal agent (amphotericin B) to treat a fungal infection. This was the standard drug for this treatment 30 years ago. However, amphotericin, which has evolved as a drug over the years, was prescribed currently by a doctor recently transferred from a different hospital where different practices applied. An amphotericin B dose was then delivered at 5 times the strength required for treatment over one hour instead of six hours and the two patients were dead within twelve hours. Similar problems arising from confusion are likely to arise where a product becomes known by a single name irrespective of several significant changes in performance over time and confusion arises over the appropriate dose required for treatment from the version of the drug actually prescribed, which could be very toxic to the patient. The question arises as to where the responsibility for such a situation lies. Is it the pharmacist or the GP?

The actual version of a drug selected for treatment such as erythropoietin, for example, which is used by renal physicians, may be subject to financial drivers on drug purchase operating at a high level, such as the London Purchasing Authority for example, where the consideration is primarily financial rather than considerations of the safety of patients exposed to a range of differing variants of a given drug, who may be subsequently informed that their drug has been switched, without their involvement or any further justification of reasons. Drug firms should take more interest in the way their products are used. Diagnostic laboratories also need to be aware that patients are taking differing versions of the same drug.

The knowledge base of biosimilars among clinicians and physicians and laboratory doctors and nurses is generally very low. It is not a topic considered suitably attractive for international meetings. A high degree of upskilling is required of the medical professionals involved in treatment with biosimilars. What is the method of characterisation of the biosimilar drugs used by the companies that produce them? Companies all go through the same assessment process in order to satisfy the requirements of the European Medicines Agency (EMEA). Most products are hospital-driven products. A patient with kidney failure comes into hospital and is started on erythropoietin and then moves out into primary care. The MHRA is responsible for monitoring drugs approved for use within the EU by the EMEA. Prices of biosimilars will become cheaper by about 20% in future.

Treatment of, for example, Paroxysmal nocturnal haemoglobinuria, which is a rare and devastating disorder will be carried out using Eculizumab, an Ultra Orphan drug produced by Alexion. This is a new anti-complement C5 antibody costing £250,000 per patient, per year, and treatment will be prescribed, following the Darzi reforms, at Leeds and Kings but will also be available more widely through clinics based at local hospitals managed and run by major hospitals. It has been reported that this year the NHS have treated more patients for less for the first time. However new biotech drugs could prove very expensive in future.

It was recommended at the Panel established to consider biosimilars that they should carry a black triangle. If an innovative product is approved by NICE then it is unlikely that they will be involved with the assessment of biosimilars. There may be a health technology assessment. However, a single group of hospitals may decide jointly to select a single product for their use to reduce the complexity of managing the supply of five different variants, for example. This reduces patient choice although some patients may respond differently to each of the variants. In addition, the NHS are treating 25 different nationalities with differing responses due to the varying background of different individuals.

Communication needs to be continually improved together with upskilling of all those involved in the management of biosimilars. Biosimilar copy companies are primarily concerned with the financial benefits of their products following registration with the EMEA, but they rarely engage with the medical community once that approval for use has been obtained.

BOOK REVIEW

Beating Stress, Anxiety & Depression Groundbreaking Ways to Help You Feel Better

By Jane Plant and Janet Stephenson. Foreword by Stephen Holgate

Published by Piatkus, £12.99, 1 May 2008

This is an intriguing book. Professor Jane Plant is Professor of Environmental Geochemistry at Imperial College London, and her co-author, Janet Stephenson, is a psychologist who works as a therapist in the NHS and in private practice. The authors point out that one person in six may suffer from chronic anxiety or depression, and many others do so temporarily. They explain in detail how they each suffered from both anxiety and depression, and how they felt that doctors, both in primary and in secondary care, failed to deal effectively and sympathetically with their problems. Jane experienced years of chronic anxiety after taking benzodiazepines to counteract the stress of cancer treatment, while Janet suffered from psychosis which followed postnatal depression, and led to her spending several months in a frightening mental institution. The authors explain how they managed, with help, to overcome their problems. In a thoughtful foreword, Professor Stephen Holgate remarks that the authors gained clear insight into their own difficulties and how to resolve them, while concurrently applying scientific rigour to understand and convey what processes may have caused their problems. The authors claim that readers of this book will discover:

a) risk factors and how to reduce them;
b) how mental health problems can be diagnosed more effectively;
c) how to ensure the best possible treatment;
d) how to acquire information on alternative approaches;
e) the ten lifestyle factors that can decrease the chances of mental illness;
f) the ten food factors that can improve mental wellbeing.

I have tried, as a neurologist with some experience in treating mood disorders, to assess the extent to which the authors have succeeded. I believe that they have achieved most if not all of their objectives. First, they deploy a remarkable understanding of neuroscience and the ways in which biochemical changes in the brain can result in the genesis and persistence of mood disorders. They also describe the complex symptomatology of anxiety and depression, and outline a classification much in line with scientific thought. Neurotransmitter function and dysfunction in mental illness are well described, as are their outlines of brain/mind/body interactions and modern neurophysiology, although I was surprised to find that acetylcholine as a neurotransmitter was not mentioned until page 201. Their outline of risk factors in chapter four is largely indisputable, as are their views on getting the best treatment in chapter five; they pay appropriate lip service, not only to the role of drugs, but also to the physical factors which may influence the mood, while also stressing the important role of counselling, cognitive behavioural therapy and other psychotherapeutic methods.

Where they are on less certain ground is in their acceptance of the role of measuring urinary catecholamines and other metabolites in diagnosis, and their espousal of amino acid therapy, based largely on the work of Lechin, whose views are not totally in tune with current neuroscience thought. They are, however, right to criticise electro-convulsion therapy and psychosurgery, while recognising that trans-cranial magnetic stimulation and deep brain stimulation may sometimes be useful in treating depression. Most of their comments on lifestyle changes and the value of exercise and rest and relaxation are unexceptionable, but they are less convincing in their comments on environmental issues, not least in relation to the potential harmful effects of pesticides. All neuroscientists appreciate the hazards produced by organo-phosphorus insecticides, but when the authors suggest, for example, the possible risks from exposure to pesticides when walking a golf course, they have a less firm scientific foundation (I write as a golfer). I was also mildly discomforted by their comprehensive chapter on nutrition and the role of food factors. This chapter contains much common sense, but their espousal of the organic food movement, along with their view that most protein in our diet should be from plant and not animal sources, have a less secure scientific foundation. They are, of course, fully entitled to express their personal opinions upon what they have found useful and helpful, but I was a little concerned to find that, whereas 90% of this book offers recommendations based upon sound scientific fact and reasoning, the authors espouse enthusiastically some which are not in my opinion evidence-based or in tune with well-accepted scientific principles.

These are relatively minor quibbles, as this is an admirable book which should do much, as Stephen Holgate says, to alleviate the fear, helplessness and hopelessness which many feel when suffering from mental ill health. The book ends with a helpful list of organisations working in mental health, and there are useful lists of scientific references as well as a recommended list of books for further reading. There is also a good index. I must conclude therefore that many sufferers from stress, anxiety and depression will find in this volume invaluable information, guidance and comfort.

Lord Walton of Detchant

Three years in Delhi

Dr Rob Daniel, Head of Science and Innovation British High Commission, New Delhi

I have led the FCO's India Science and Innovation team for nearly three years. As a job and place it has never disappointed. India is a diverse land of contradictions and in the course of this article I will explore what that means for us in the science and innovation community.

The dragons and tigers of the Far East may be cunning, ruthless and fast, but the Indian elephant stands squarely on its feet making its steady if ponderous progress unstoppable. India the re-emerging powerhouse is a fact. A billion plus people working together makes a big impact, but India's continually forward momentum is also down to their ability to be focused in spite of the trials of everyday life.

This tenacity is as true for the science sector as any other. India does not have the biggest research output, far from it, but it continues to grow. The Indian Government wisely spends its economic windfalls on its biggest asset – its youth. India is a country with a young population, with 60% of the people under 40. Yet only 50% of the population are educated to a basic level. To overcome this, the Indian Government has instigated an expansion of its education system that would be staggering to all, but China. For around 50 years India has had just seven elite Indian Institutes of Technology (IIT) and a solitary Indian Institute of Science (IISc) for a hundred years. This year the Government will break ground on new IITs and five new Indian Institutes of Education and Research, along with seven new Indian Institutes of Management, 20 Indian Institutes of Information Technology, and 30 new central universities. This pyramidal relationship carries on right down to the secondary school level with 6,000 on the drawing board.

This massive expansion is one of the reasons that I am here as Head of the FCO's India SIN team. We need to ensure that the UK is part of this change and I feel strongly that effort now, at the beginning, will pay huge dividends for us in the future, much as it did a hundred years ago when the Royal Society was instrumental in the setting up of the IISc.

This is not the only role of the SIN network in India as we work on a wide range of projects that are more short term in their outlook, but will have far reaching implications for the future. For example, DfID India recently launched its new action plan in which it describes three faces of India. The poorest 400 million live on $1 a day; the developing India of 500 million who live on less than $2 a day; and the 'Global India', who answer our banking or computer enquiries and invest heavily in the UK and gold. Despite its advances these figures show that India still faces problems that it cannot deal with all by itself. So, climate change has the potential to impact seriously on the annual monsoon that brings life to the subcontinent, without which it would resemble the deserts of Arabia. To the overwhelming majority this would be catastrophic.

India has a tremendous capacity to innovate and use technology where appropriate. The Science Network is working with teams to develop beyond 3G networks that have the capacity to connect even the remotest of villages. This is not just bringing communication to the far flung places, but also jobs.

It is not all about the UK assisting with India's problems. We firmly believe in mutually beneficial collaboration as there is a great deal that India can teach us. The hottest topic these days is outsourcing. This phenomenon in India is not based solely on lower labour costs. The many knowledge process outsourcing companies that have come into existence have done so on the back of innovation. This is not innovation in the classic sense that results in a fancy gadget or groundbreaking discovery. It is innovation that removes the cost of manufacturing that gadget, or innovation that removes the cost from the company processes that support the manufacture of the gadget. It is innovation that helps us to see problems from a completely different angle and provide low cost solutions. It seems so simple yet we have yet to embrace fully these concepts as we continually strive for the "Rolls Royce" solution.

In conclusion I need not hesitate in saying that I have spent a rewarding and useful three years in India. I will leave my post satisfied that I am a changed man and have made a difference. But I will also leave thinking that there is so much more to do and that this was just the tip of the iceberg, or perhaps that should be the tip of the trunk. As much as I have tried those who succeed me will still have a long and probably potholed road to travel. My simple advice is "be patient".

House of Commons Select Committee on Innovation, Universities, Science and Skills

Under the Standing Orders, the Committee's terms of reference are to examine "the expenditure, administration and policy" of the Department for Innovation, Universities and Skills and its associated public bodies. This includes the Government Office for Science, headed by the Government Chief Scientific Adviser.

The new Committee was nominated on 8th November 2007. The current Members of the 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 Ian Gibson (Lab, Norwich North), 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 (UKIP, 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 Phil Willis was elected Chairman of the Committee at its first meeting on 14th November 2007.

Oral Evidence

The Leitch Review of Skills

On 28th April 2008 the Committee held a one-off session with Lord Leitch and Louise Tilbury, former leader of the Leitch Review team to discuss the Leitch Review of Skills.

The Office for Fair Access (OFFA)

On Monday 2nd June the Committee held a one-off session with Professor Sir Martin Harris, Director of Fair Access at the Office for Fair Access (OFFA). OFFA's aim is to promote and safeguard fair access to higher education for under-represented groups following the introduction of variable tuition fees in 2006-07. The session focused on how effective OFFA is in promoting and safeguarding fair access to higher education for under-represented groups and how the effects of OFFA's work are measured.

Current Inquiries

Biosecurity in UK research laboratories

On 6th December 2007 the Committee announced an inquiry into biosecurity in UK research laboratories. The inquiry has focused on the capacity for research on dangerous pathogenic material in the UK, the state of biological containment facilities, inspection regimes and the licensing system, maintenance and recording practices, storage and transportation of dangerous pathogens and the measures implemented when pathogenic material cannot be accounted for, as well as both biosafety training and the role of universities in overseeing security clearance for research students working with dangerous pathogens.

The Committee has held three evidence sessions, hearing from the regulators, funding agencies, organisations running high containment laboratories, scientists working in this area, biological safety officers and Ministers. A Report was published on 25th June.

Engineering

On 29th January 2008 the Committee announced an inquiry into engineering. The inquiry focuses on the role of engineering and engineers in UK society, the role of engineering and engineers in UK's innovation drive, the state of the engineering skills base in the UK, including the supply of engineers and issues of diversity (for example, gender and age profile), the importance of engineering to R&D and the contribution of R&D to engineering and the roles of industry, universities, professional bodies, Government, unions and others in promoting engineering skills and the formation and development of careers in engineering.

As part of the main inquiry the Committee has held three evidence sessions, hearing from young engineers, academics, academic institutions, bodies representing engineers, employers and industry, and other organisations with an interest in engineering. Further evidence sessions will take place over the coming months.

The inquiry will be wide-ranging and the Committee will explore some of the themes using case studies, two of which have already been announced. The first of these is plastic electronics and focuses on the current and future roles of engineers in the field of plastic electronics, the potential for plastic electronics in the UK/global economy, how universities, industry, venture capital and Government are involved in the development of the UK plastic electronics sector and whether the UK engineering and manufacturing sector are set up to handle growth in this area. The second case study is nuclear engineering and focuses on the UK's engineering capacity to build a new generation of nuclear power stations and carry out planned decommissioning of existing nuclear power stations, the value in training a new generation of nuclear engineers versus bringing expertise in from elsewhere, the role that engineers will play in shaping the UK's nuclear

future and whether nuclear power proves to be economically viable and the overlap between nuclear engineers in the power sector and the military.

After Leitch: Implementing Skills and Training Policies

On 4th March 2008 the Committee announced an inquiry into the implementation of skills and training policies following the Leitch Report and how responses to the agenda set out in the Leitch Report will affect the broader structures of further education, higher education and lifelong learning. The inquiry focuses on the responses of RDAs to Leitch and how coherent and structured these are, what the existing regional structures of delivery are and what sub-regional strategies may be required, the role of the Learning and Skills Council and Sector Skills Councils in this context, the respective roles of the further education and higher education sectors in delivering a region-based agenda for Leitch and their co-ordination with one another and the impact on students of these initiatives, particularly in the context of policies for lifelong learning.

The Committee has held two evidence sessions. The inquiry began with an evidence session in Leeds to discuss planning and delivery of skills in the Yorkshire and Humberside region. At the second evidence session, in Westminster, the Committee heard from academics and representatives from industry. Three further evidence sessions are planned, at which the Committee will hear from the UK Commission for Employment and Skills, Sector Skills Councils, Employment and Skills Boards, Regional Development Agencies, the Learning and Skills Council, representatives of further and higher education, unions and Ministers.

Reports

Science Budget Allocations

On 30th April 2008 the Committee published its Fourth Report of Session 2007-08, Science Budget Allocations, HC 215.

Renewable electricity-generation technologies

On 19th June 2008 the Committee published its Fifth Report of Session 2007-08, Renewable electricity-generation technologies, HC 216.

Government Responses

One Government Response to a Report by the former Science and Technology Committee has been received by the Innovation, Universities, Science and Skills Committee.

Investigating the Oceans

On 15th May 2008 the Innovation, Universities, Science and Skills Committee published its Fourth Special Report of Session 2007-08: Investigating the Oceans: Government Response to the Science and Technology Committee's Tenth Report of Session 2006-07, HC 506.

Three Government Responses have been received by the Innovation, Universities, Science and Skills Committee.

The work and operation of the Copyright Tribunal

On 16th June 2008 the Innovation, Universities, Science and Skills Committee published its Fifth Special Report of Session 2007-08: The work and operation of the Copyright Tribunal: Government Response to the Committee's Second Report of Session 2007-08, HC 637.

Withdrawal of funding for equivalent or lower level qualifications (ELQs)

On 17th June 2008 the Innovation, Universities, Science and Skills Committee published its Sixth Special Report of Session 2007-08: Withdrawal of funding for equivalent or lower level qualifications (ELQs): Government Response to the Committee's Third Report of Session 2007-08, HC 638.

Science Budget Allocations

On 17th June 2008 the Innovation, Universities, Science and Skills Committee published its Seventh Special Report of Session 2007-08: Science Budget Allocations: Government Response to the Committee's Fourth Report of Session 2007-08, HC 639.

Further Information

Further information about the work of the Innovation, Universities, Science and Skills Committee or its current inquires can be obtained from the Clerk of the Committee, Dr Lynn Gardner, the Second Clerks, Glenn McKee and Edward Waller or from the Committee Assistant, Ana Ferreira on 020 7219 2792/8367/0859/2794; or by writing to: The Clerk of the Committee, Innovation, Universities, Science and Skills Committee, House of Commons, 7 Millbank, London SW1P 3JA. Inquiries can also be emailed to iuscomm@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/ius 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 13 November 2007) are Lord Colwyn, Lord Crickhowell, Lord Haskel, Lord Howie of Troon, Lord Krebs, Lord May of Oxford, Lord Methuen, the Earl of Northesk, Lord O'Neill of Clackmannan, Lord Patel, the Earl of Selborne, Lord Sutherland of Houndwood (Chairman), Lord Taverne and Lord Warner. Baroness Walmsley and Lord Soulsby of Swaffham Prior were co-opted on 14 January 2008 for the purposes of the Systematics and Taxonomy inquiry and Lord Broers and the Earl of Erroll were co-opted on 25 March 2008 for the purposes of the Personal Internet Security follow-up.

Personal Internet Security

The Committee's report on *Personal Internet Security* was published on 10 August 2007, and was widely reported in the broadcast and print media. The inquiry, chaired by Lord Broers, looked at a broad range of security issues affecting private individuals when using the Internet. Key recommendations included:

- Increasing the resources and skills available to the police and criminal justice system to catch and prosecute e-criminals;
- Establishing a centralised and automated system, administered by law enforcement, for the reporting of e-crime;
- Incentivising banks and other companies trading online to improve data security by establishing a data security breach notification law;
- Encouraging better security standards in new software and hardware by taking the first steps towards the establishment of legal liability for damage resulting from security flaws;
- Encouraging Internet service providers to improve the security offered to customers by establishing a 'kite mark' for Internet services.

The Government response to the Committee's report was published as a Command Paper (Cm 7234) on 24 October 2007. The Committee has sought comments on the Government response from those who gave oral evidence during the original inquiry. The Committee will publish a short follow-up report in July and it is expected that both the original report and the follow-up report will be debated by the House by the end of the year.

Allergy

The Committee's report on allergy was published in September 2007. The Government published its response on 27 November and a debate took place in the House on 8 May. (Summary on page 47).

Radioactive Waste Management

The Select Committee's report *Radioactive Waste Management: an update* was published on 4 June 2007 and Government's response was received on 25 June. The Committee's report was debated on 29 October 2007. The Government response was published on 7 February 2008.

Air Travel and Health

The Committee's report on *Air Travel and Health – an Update* was published on 12 December 2007 and was widely reported in the media. The Government response was received at the end of February and was published with a commentary on 19 May 2008. It is expected that both the report and the commentary will be debated by the House by the end of the year.

Waste Reduction

Last year the Select Committee appointed a Sub-Committee, chaired by Lord O'Neill of Clackmannan, to inquire into Waste Reduction. In November and December the Committee heard from civil servants, academic experts and the Environment Agency on the various types of legislation which impact upon waste reduction. Since January, the Sub-Committee has looked in more detail at the various roles that designers, manufacturers and retailers can play in reducing waste. The inquiry has examined a range of sectors and evidence has been heard from industry organisations including British Glass, the Aluminium Federation, the Engineering Employers' Federation, the Manufacturers' Organisation, the Chemical Innovation Knowledge Transfer Network, Industry Council for Packaging and the Environment, the Building Research Establishment and Institution of Civil Engineers. In addition, evidence has also been taken directly from companies, including Hewlett Packard, Panasonic, Sony, Philips, Proctor and Gamble, Unilever, Marks and Spencer, Nissan and Volkswagen.

Genomic Medicine

The Select Committee has appointed a second Sub-Committee, chaired by Lord Patel, to hold an inquiry into genomic medicine. The call for evidence was published on

25 February with a deadline for submissions of 21 April. The inquiry will examine the policy framework in this area, the latest research and scientific developments, translation opportunities into the clinic, genomic databases and the use of genetic information in a healthcare setting. The Committee has held a number of public meetings since late April and has taken evidence from, amongst others, the Medical Research Council, the Department of Health, the Wellcome Trust, Cancer Research UK, and the Royal College of Physicians.

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 with representatives from other organisations including the Food and Drug Administration, Harvard Medical School, and the American Society of Human Genetics. It is expected that the Committee's report will be published in spring 2009.

Systematics and Taxonomy

The Select Committee is about to complete a short inquiry into systematics and taxonomy. A call for evidence was published in December. The inquiry is a follow-up investigation from the Committee's past inquiries into this subject (in 1991 and 2002) and is looking at the UK's capability in this field, taxonomic data collection and management, and the skills base. The inquiry is also looking at the application of taxonomic data, for example, in environmental change monitoring. The Committee has taken evidence from, among others, Government officials, the Research Councils, the Royal Botanic Gardens Kew and Edinburgh, the Natural History Museum, the Systematics Association and Linnean Society of London. In May, the Committee took evidence from three Ministers (Ian Pearson, Lord Rooker and Margaret Hodge). It is expected that the Committee's report will be published in July 2008.

Further information

The written and oral evidence to the Committee's inquiries mentioned above, as well as the Calls for Evidence on the Committee's new inquiries, 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, Clerk (salmonc@parliament.uk or 020 7219 6072). The Committee's email address is hlscience@parliament.uk.

Parliamentary Office of Science and Technology

Recent POST Publications

Research Ethics in Developing Countries
April 2008 *POSTnote 304*

The UK funds an increasing amount of biomedical research in developing countries. Research proposals are reviewed by research ethics committees, usually in both the UK and the countries where research is to take place. Exact ethical requirements vary according to national policy, funding body and research institution. A key international document on research ethics, the Declaration of Helsinki, will be revised in 2008. This POSTnote describes the types of research conducted in developing countries, the ethical review process and the issues arising.

Next Generation Broadband Access
April 2008 *POSTnote 305*

The UK has comparatively high coverage and take-up of broadband access, but several other countries have begun to deploy 'next generation' infrastructure to support faster access. This POSTnote examines next generation access (NGA) technologies, demand for them and deployments worldwide. It looks at the debate over who should invest in NGA and when, and considers policy issues such as international competitiveness and geographical variations.

Electricity Storage
April 2008 *POSTnote 306*

Storing electricity on a large scale enables power generated when demand is low to be stored for release at peak demand periods. Storage may become more important because renewable energy sources such as wind and solar do not produce constant levels of power. This POSTnote examines existing and proposed methods for large scale electricity storage, examines the technical challenges and discusses the economics of storage relative to other methods of providing electricity reserves.

Wildlife Diseases
April 2008 *POSTnote 307*

Wildlife diseases can have negative consequences for biodiversity, human and livestock health, animal welfare and the economy. At present UK wildlife disease surveillance is poorly co-ordinated. The lack of a cohesive approach stems from a division of responsibility and a dominant focus on livestock and human health. This POSTnote examines the impacts of wildlife diseases, the current status of surveillance in the UK and the options to strengthen policies.

Alternatives to Custodial Sentencing
May 2008 *POSTnote 308*

There has been considerable recent debate about overcrowding in UK prisons. The system is struggling to accommodate the growing number of young offenders being given custodial sentences. This POSTnote sets out the scale of the problem and looks at recent trends in sentencing, with a particular focus on young offenders. It examines the factors linked with offending and asks whether better understanding of these can be used to target early actions aimed at deterring young people from offending. Finally, the note examines alternatives to custodial sentencing and assesses how successful these have been in practice.

International Migration of Scientists and Engineers
June 2008 *POSTnote 309*

Global competition for scientists and engineers (S&Es) is rising as their role in economic development is increasingly recognised. Many countries are looking to S&Es from overseas to address skills gaps: in February 2008 introduction of new immigration laws favouring some categories of skilled migrant began in the UK. This note looks at the causes and impacts of migration of S&Es, focusing on the developing world, where they play a key role in tackling poverty reduction.

Marine Conservation Zones
June 2008 *POSTnote 310*

The proposed Draft UK Marine Bill aims to combine legislation on activities and conservation in the marine environment into a single framework. This includes the designation of a network of Marine Conservation Zones (MCZs) in UK waters, a form of marine protected area (MPA). MPAs are described as any area of intertidal or subtidal terrain, together with its overlying water and associated flora or fauna, historical or cultural features, which are protected by legal or other effective means. This POSTnote examines the possibility of using a MCZ network to manage the impacts of human activities on the marine environment.

Current work

Biological Sciences – Assisted Reproduction, Single Embryo Transfer, Animal Cruelty and Interpersonal Violence, Vaccine Capacity in the UK, New Anti-Infectives

Environment and Energy - Marine Conservation Zones, Biological Indicators and Future Nuclear Technologies

Physical sciences and IT – Digital preservation, E-democracy and Big Science

Seminars

During the period POST organised two highly successful receptions in the Members' Dining Room, one on robotics, partnered by the Institute of Physics, the association "Walking with Robots" and the journal *Science*. The second was held in collaboration with the inter-university Omega consortium on 3rd June and was on "Unlocking Greener Aviation".

Smaller seminars were held on Wildlife Diseases, Invasive Non-native Species, and Adult Autism Policy

Staff, Fellows and Interns at POST

POST doctoral fellows:
Nathalie Doswald, Durham University, Natural Environment Research Council

Simon Evans, University of Bristol, Royal Society of Chemistry

Will Fletcher, University College London, Engineering and Physical Sciences Research Council

Fiona McEwan, Kings College London, Medical Research Council

Eleanor O'Rourke, University of Liverpool, Natural Environment Research Council

Stella Cridge, London School of Economics, Economic and Social Research Council (Stella worked with the DIUSS committee on its current inquiry into engineering skills)

International activities
Dr O'Brien was an observer at the 1st Annual Pisces (Policy Innovation Systems for Clean Energy Security), and CAG (Consortium Activity Group) meeting in Tanzania. Dr Nath has continued her part-time secondment to work on POST's Africa programme, while the Association of Commonwealth Universities has awarded a scholarship to POST to bring a Ugandan parliamentary researcher to the UK on a three-month Commonwealth Professional Fellowship.

House of Commons Library Science and Environment Section

Research Papers

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

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

Health and Safety (Offences) Bill: Committee Stage Report

Research Paper 08/50

The Bill is sponsored by Keith Hill, who drew ninth place in the 2007/8 ballot for Private Members' Bills. The Bill would increase sentences for various offences under the Health and Safety at Work etc. Act 1974. It has Government and cross-party support. The Bill was not amended in Committee.

Human Fertilisation and Embryology Bill [HL]: Committee Stage Report

The Bill would revise and update legislation for assisted reproduction and also change the regulation and licensing of the use of embryos in research and therapy. It includes provisions for research on different types of embryos, and proposes changes to definitions of legal parenthood for cases involving assisted reproduction.

The provisions of the Bill covering issues of "saviour siblings", "admixed embryos" and "need for a father" and new clauses or schedules relating to abortion were committed to a Committee of the whole House on 19 and 20 May 2008. The remainder of the Bill was scrutinised by a Public Bill Committee.

The Bill was not substantially altered in Committee though Government amendments to the definition of embryos were agreed as were Government amendments on the use and storage of cells from those lacking capacity (either as children or adults) or where the donor can no longer be identified or has died.

Selected Debates and Parliamentary Questions & 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 21st April to 22nd May 2008 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

Education

Science and Discovery Centres (Funding)
Debate in Westminster Hall on Thursday 15 May

Mr Phil Willis (Harrogate and Knaresborough): I am extremely pleased to open this debate on the subject of the eleventh report of the former Science and Technology Committee, published in October 2007. I pay tribute to the hon. Member for Bolton, South-East (Dr Iddon) who not only encouraged the Committee to conduct this inquiry, but, as a director of the Bolton technology innovation centre, has been a committed advocate of science and discovery centres and their vital role in the science agenda. There are more than 100 science centres in the UK, attracting some 19.5 million visitors a year. They range in size from huge centres, such as the Science Museum in London and the Eden Project in Cornwall, to very small ones, such as the Armagh Planetarium in Northern Ireland and the Scottish Seabird Centre in the firth of Forth.

The Committee decided to conduct the inquiry for three reasons: first, because the hon Member for Bolton, South-East constantly said that we should. The second reason was the widespread concern over the financial security and future of science centres. Of the 18 science centres given capital grants by the Millennium Commission, two have already closed – the Earth Centre, in Doncaster, and the Big Idea, in Ayrshire. Furthermore, the Explore-At-

Bristol centre has partially closed after it shut down its "wildwalk" facility and IMAX attraction. Since our inquiry, yet another has closed – the Inspire in Norwich. In addition, the future of Jodrell Bank which set up one of the first science centres in the world, back in 1965, hangs in the balance. Catalyst, at Widnes, which during this academic year delivered 575 science lessons to more than 17,000 children, struggles to survive and has been within a few days of closure on several occasions in the past five years, despite tremendous involvement from the chemical industry, local authorities and Members of this House.

The third reason why we looked at this subject was to examine what role science centres had within the Government's agenda for science, technology, engineering and mathematics – STEM – to which, to their credit, they remain highly committed. They have acknowledged the important role that science centres play in promoting to young people STEM subjects and careers in science. Yet the bulk of our recommendations on science centres were rejected out of hand by the Government, and science centres continue to struggle.

The Minister for Science and Innovation (Ian Pearson): I am grateful to the hon Member for Harrogate and Knaresborough (Mr Willis) for introducing the debate. I am also grateful to the other contributors to it, particularly my hon Friends the Members for Bolton, South-East (Dr Iddon) and for Norwich, North (Dr Gibson), who, over a long period, have shown a deep interest in the issues under discussion. I shall set out the Government's views on science centres and our plans for the future. I stress that it is a Government-wide view. We acknowledged in the response to the Select Committee's report that the Department for Innovation, Universities and Skills will take the lead on science centre issues within Government, but we will work closely with the Departments for Culture, Media and Sport and for Children, Schools and Families, because they share an interest in that agenda. Indeed, both DIUS and the DCSF funded Ecsite-uk's recent science centre enrichment activity grant scheme, and officials from all three Departments maintain contact on the issues and worked together to formulate the response to the Committee's recommendations.

I understand the arguments about museums and the comparisons drawn between science centres and museums, whether they relate to their public engagement work or their funding. I stress that museums clearly have a public engagement role; they are not just about collections. However, it is important to dispel some misconceptions about museums and science centres. I do not think that those misconceptions are found among members of the Select Committee, but they might be found in the wider community.

The first misconception is that the two types of institution are essentially the same. It is true that a number of museums, perhaps most notably the Natural History Museum and the Science Museum, are affiliates of the Ecsite-uk network and can be classified as science or discovery centres. However, in the Government's mind, there is an important distinction between a museum and another type of visitor attraction: the possession of a collection.

The second misconception arises from the fact that many people believe that the Government fund free access to all museums in England and are therefore duty-bound to fund a similar scheme for all science centres. The simple fact is that only a small number of museums in England are funded directly by central Government. The Museums Association estimates that there are about 2,000 museums in England. The vast majority either are funded by local authorities – 689 museums in total – or are independent charities; that is the case for 811 museums. The policy on admission prices for those museums is a matter for the relevant council, its councillors and the local community, or the trustees of the organisation, depending on its status. I see no possibility that the DCMS will open up its budget to science centres.

Energy

Geothermal Power
Question and Written Answer on Monday 21 April

Jenny Willott (Cardiff Central): To ask the Secretary of State for Business, Enterprise and Regulatory Reform what estimate he has made of the potential thermal generation capacity of geothermal technologies in the UK; and if he will make a statement.

Malcolm Wicks: Between 1976 and the early 1990s the UK carried out a major Geothermal Research Programme at a cost in excess of £50 million. The key conclusions from the programme were that the UK was unlikely to see major developments based upon geothermal aquifers or the hot dry rock (HDR) method due to a limited resource, limited scope for their application and unfavourable economics.

The programme produced estimates of the potential geothermal resource for both HDR and aquifers. Its final report estimated the accessible HDR resource in the UK regardless of cost to be 1,500 Terawatt hours of electricity, that if exploited over 25 years would result in 60 TWh/year or 7,600 MW of net output power at 90 per cent availability. However, once possible constraints were taken into account it estimated that the practicable HDR resource could be as low as 4 TWh/year or 500 MW over 375 years.

A final report of the Geothermal Aquifers Programme estimated the UK resource for three temperature ranges:

Temperature range	Mtce (million tonnes coal equivalent)
Over 60C	183
40 to 60C	1771
20 to 40C	2285

Although these figures are large the report estimated that the exploitable resource was much smaller when taking account of the coincidence of high heat load density and resource. It estimated that the possible take-up of the resource based on a total of 100 schemes being developed

would produce a total saving of 0.35 Mtce per annum.

To make geothermal power a more attractive economic prospect in the UK now would depend on addressing the technical and practical constraints identified by this previous Geothermal Programme.

Notes:
1. Geothermal Hot Dry Rock UK Government R and D Programme 1976-1991, ETSU-R-59, 1992

2. Geothermal Aquifers Department of Energy R and D Programme 1976-1986, ETSU-R-39, 1986

Renewable Energy: Seas and Oceans
Question and Written Answer on Wednesday 30 April

Lembit Öpik (Montgomeryshire): To ask the Secretary of State for Business, Enterprise and Regulatory Reform what assessment he has made of (a) the potential to derive energy from ocean swell and (b) designs which are capable of capturing energy from very large ocean swell; and if he will make a statement.

Malcolm Wicks: The Carbon Trust has estimated that the total resource for wave and tidal stream/range generation in the UK is around 43 GW. They have estimated that, ultimately, around 15-20 per cent of the UK's current electricity demand could be supplied by wave and tidal stream technologies. Of this, 10-15 per cent could be from ocean swell (ie wave) energy.

There are a wide range of devices being developed to generate electricity from ocean waves but none has yet progressed to a stage where they are ready for deployment at a commercial scale. The Government have provided support for research and development into wave energy to meet the needs of innovation at all stages of technology readiness. This includes funding through the Engineering and Physical Sciences Research Council "SuperGen" programme, the Technology Strategy Board, the new Energy Technologies Institute (ETI) and the Carbon Trust. The ETI's first call for expressions of interest, launched in December 2007, included proposals for research into wave and tidal energy.

In addition, BERR has £42 million funding available under the Marine Renewables Deployment Fund to support the commercial demonstration of full scale wave and tidal energy devices. When they are deployed, they will be supported by the renewables obligation, under which they will receive an enhanced level of support.

Government support for wave and tidal energy technologies will be reviewed as part of the UK Renewable Energy Strategy Consultation which is due to be published in the summer.

Biofuels: Research
Question and Written Answer on Tuesday 13 May

Mr Greg Knight (Yorkshire East): To ask the Secretary of State for Environment, Food and Rural Affairs what the value was of grants made by his Department for research into biofuels since 1 January 2006; and to which organisations they were given.

Mr Woolas: DEFRA's bio-energy R and D focuses on the genetic improvement and selection of biomass crops such as willow and miscanthus. Current spend is about £900,000 per year, which provides underpinning R and D for both second generation biofuels and solid biomass for energy. Other relevant work is being funded jointly with industry to breed wheat and oilseed rape varieties that require reduced fertiliser inputs (£331,000 in 2008-09 and approximately £814,000 in 2006-07 and 2007-08 combined).

It is difficult to separate out the work exclusively on biofuels, but a specific project was funded in 2007 to assess 'Greenhouse gas emissions and environmental sustainability of international biofuels production and use' (£37,000).

Organisations funded by DEFRA since 2006 are Aberystwyth University (IBERS), Rothamsted Research, AEA Technology, the National Institute of Agricultural Botany (NIAB), Warwick HRI and ADAS.

DEFRA, through the International Sustainable Development Fund, are also funding two (desk) studies into Brazilian biofuels and their sustainability. One is by the university of Campinas, into bioethanol, and the other is by the university of Sao Paulo, into biodiesel. They are around £50,000 each.

Environment

Metals Recycling Industry
Debate in Westminster Hall on Tuesday 22 April

Dr Alan Whitehead (Southampton, Test): As a society, we are consuming natural resources at an unsustainable rate. If every country consumed natural resources at the rate the UK does, we would need three planets to live on. Our aim must be to reduce waste by making products with fewer natural resources. We must break the link between economic growth and waste growth. Most products should be re-used or their materials recycled. Energy should be recovered from other wastes where possible. For a small amount of residual material, landfill will be necessary.

The object of a waste strategy, in a world of depleting natural resources is to stop waste materials entering the waste stream. If we cannot do that, the next best thing is to ensure that they can be reused with as little energy expenditure as possible, thereby stopping the entry into the system of virgin materials that might have been produced at great energy cost with the consequence of the further depletion of natural resources.

Through the operation of protocols setting out how materials are to be stewarded and processed, we can prevent many materials from being categorised and treated as waste. Metal is one material that fits that

description almost exactly. By recovering and reprocessing ferrous and non-ferrous metals, we can supply all that we need for remaking metal products, and we can do so over and over again with no real deterioration in the quality of the recovered material. That means that the energy that we use in the process – and hence carbon emissions – is hugely reduced in comparison with that resulting from the use of virgin material.

The chief danger arises from the fact that the metals recycling industry is still classed as a waste industry, despite the overwhelming evidence that protocols could be established that would class the industry as a resource provider. There are no protocols, however, and metals do not feature on the list of materials for which the Environment Agency is providing protocols. Not even metal shavings and offcuts escape that classification, with all the issues that are then involved – quite rightly for much waste – in the operation of the EU waste framework directive, including handling restrictions, processing precautions and the certification processes that accompany waste on its way to landfill, hazardous waste tips or inert disposal. Hardly any metals go along this route, and yet they are classified as if they do.

Tony Baldry (Banbury): In the UK, metal recycling is a well established, £4 billion to £5 billion industry. Recovering 15 million tonnes a year, it is the UK's biggest recycling industry. As we process far more metal than domestic manufacturers need, we are one of the world's largest exporters of recovered metals, it goes unrecognised.

The industry faces several challenges. There is the problem – resulting, rather bizarrely, from a European Court judgment on the EU packaging directive – that recovered metal is classified as waste under European law. That approach means that the industry has been subjected to an increasing burden of waste regulation, which applies even when metal has been fully separated and prepared as secondary raw material. The need for redefinition has become urgent with the introduction of the new 2007 regulations on trans-frontier shipment of waste, because they are creating trade barriers, shipment delays and advantages for non-European competitors. It is somewhat bizarre to provide opportunities for non-EU states. Given the UK's leading position in export trade, the situation is particularly damaging to UK metal recycling.

The revised EU waste framework directive, which is currently having its Second Reading in the European Parliament, creates an opportunity for long-term change. The directive will enable reconsideration of the point at which certain materials cease to be waste. Reclassification is urgently needed, and the European Commission has carried out a metals case study in anticipation that metals will be one of the first materials to be considered. Amendments threaten to introduce new administrative hurdles, and could prevent the "end of waste" outcome. Our only locus in this issue is for us to lobby or make submissions to the Minister, who has a locus through membership of the Council of Ministers. However, there is no forum in which we get alongside Members of the European Parliament and say to our colleagues there that this issue is of significance to the UK and to UK industry.

The Parliamentary Under-Secretary of State for Environment, Food and Rural Affairs (Joan Ruddock): I share the view that the benefits of metal recycling are considerable. Such materials can be used time and again, and in doing so we use our natural resources wisely and avoid using the energy involved in extracting raw materials. The industry is vital to our achieving our EU targets on packaging, on end-of-life vehicles, on batteries and on electrical and electronic equipment.

Members raised a number of issues relating to how environmental regulation affects the metals recycling industry such as the European Court judgment by which we are all bound. Possibly the most significant issue relates to the question of when waste stops being waste. The revised waste framework directive addresses that question. The common position agreed by the Council proposes the development of end-of-waste specifications and criteria. That position identifies scrap metal as one of the categories of waste for which such criteria should be developed. The aim of the proposal is to facilitate the use of waste that has undergone recovery, while continuing to maintain high levels of environmental protection. The common position provides that waste that ceases to be waste under that procedure would also stop being waste for the purpose of the recovery and recycling targets in other EU waste legislation.

Over the next few years we face challenging EU targets on recovery and recycling. The target to reuse, recover or recycle 95 per cent of the materials used in a car by 2015 is demanding by any standards. This year, a new advisory body was established on waste electrical and electronic equipment. There is also a waste strategy stakeholder forum. A plethora of bodies is involved in recycling those materials that concern us today. We believe that, together those groups will provide the long-term strategic approach needed to enable us to achieve our targets.

Antarctic: Tourist Ships
Debate in Grand Committee on Thursday 15 May

Viscount Montgomery of Alamein asked whether the passenger safety and environmental protection regulations covering tourist ships in Antarctic waters are satisfactory. On 15 January last year, in the short debate on the International Polar Year 2007-08, he drew attention to the increase of shipping during the Antarctic summer tourist season, and the risk of accidents. Sadly, this was all too prescient as within a month, the MS "Nordkapp" ran aground, sustaining a big gash in her bow. In November last year, the Liberian registered ship "Explorer" hit an iceberg and sank. The crew and passengers were all evacuated to lifeboats, but they were open lifeboats. Very fortunately, the sea was calm and they were all picked up several hours later. If the weather conditions had been less favourable – high seas are quite frequent in that part of the world – they would have survived only a few minutes in the sub-zero water.

We need to know what measures are being taken to ensure that there are adequate controls on the number and quality of the tourist ships visiting Antarctica. The British Government do not control this matter, but we are important members of the International Maritime Organisation, located in London, and supporters of the British Antarctic Survey located in Cambridge. The issue was raised by the UK at the Antarctic treaty consultative meeting in Delhi last year, and I hope that it will be raised again at the Kiev meeting in June.

Other questions include: should ships burning heavy fuel oil be banned? It would be very damaging if leaks occurred. Should ships without ice-strengthened hulls be banned? Are crew training standards adequate? The UK cannot issue mandatory instructions to foreign-flagged vessels in international waters. The IMO is the only body that can impose international standards covering equipment and procedures. An IMO sub-committee has been appointed to consider design and equipment in ice-covered waters but that it is not expected to report until some time next year.

Lord Bassam of Brighton: The Antarctic is a place of great beauty and wonder – a pristine environment like no other on earth. It is an area of global significance due to its profound impact on the world's climate and ocean systems. With climate change being to the fore of our thinking, that significance and its importance are increasing. The land mass occupies something like a tenth of the overall land mass of the globe and has a profound effect on the environment. The area is attracting an increasing number of tourists. A record 4 million Europeans took a cruise last year, of which 1.3 million passengers came from the United Kingdom. The rate of growth is currently 17 per cent per annum.

Cruising is a success story and the United Kingdom industry and our citizens are benefiting significantly from the opportunities afforded by this growth. It is a benign growth but one with challenges. It is benign because it extends and raises our interest levels and awareness of the wider world and globalisation. The Antarctic region is also becoming a destination of choice for many cruise ship operators. Until recently, few people other than scientists and explorers had ever visited Antarctica. In the past few years, however, the region, particularly the Antarctic Peninsula, has become a common destination on many cruise itineraries.

The UK recognises tourism as a legitimate activity under the Antarctic Treaty and supports the self-regulatory framework established by the International Association of Antarctica Tour Operators. Nevertheless, we are concerned to ensure that there is proper management of the tourism industry in the Antarctic and to set strict environmental guidelines. We are also concerned to ensure that tourism to the Antarctic is carefully planned and monitored to ensure the safety of those involved as well as to minimise the environmental impact of their activities.

Environment Agency: Flood Management
Debate in the House of Lords on Tuesday 20 May

Lord Rotherwick asked what assessment has been made of the risks of flooding from inland rivers in the United Kingdom and the role of the Environment Agency as the delegated body for managing it. Last year this country suffered considerable flooding. The statistics show that five people died, 600 were injured, 3,500 people were rescued, 27,000 houses were flooded, 6,710 of these households were still displaced by March this year, 5,000 businesses were flooded, 858 schools were damaged, and 42,000 hectares of agricultural land were flooded.

The fire brigade's rescue efforts were the biggest in peacetime Britain. These floods led to the biggest loss of critical infrastructure since World War II. Ministerial estimates last August put the cost of the flood damage at £2.7 billion. The insurance industry has concerns that this is not a one-off but a worsening trend. Claims in the UK for storm and flood damage in the five years up to 2003 were £6.2 billion, double the figure for the previous five years, and it is estimated that these costs could triple by 2050.

Between 1997 and 2005, some 120,000 dwellings were built in England in designated flood-risk areas, which represents some 9 per cent of all dwellings built over this period. In 2005, 21 major planning applications were approved against the Environment Agency's guidance. A proportion of the 3 million houses discussed in the Government's July 2006 Housing Green Paper will be built on flood plains, notably in the Thames Gateway. The Government's stated policy is to avoid inappropriate development in flood-risk areas. Has that policy changed?

The Environment Agency is responsible for strategic overview of all flood and coastal erosion risk management, and, as of January this year, the inland flooding role was still being developed. The management of large rivers and areas of low-lying coastline are its responsibility. The Department for Environment, Food and Rural Affairs, Defra, delegates to the EA the management of rivers in the interest of wildlife and having regard to flooding. There is a lack of clarity where the needs of wildlife conflict directly with the interests of human communities.

The Environment Agency estimates that it will have spent £65 million in support of flood-risk management in the last financial year. In the current financial year some £439 million has been allocated to the EA for flood-risk management, and a further £21 million to local authorities and internal drainage boards for capital improvement projects to reduce flood risk. Other funding is available from the Department for Communities and Local Government for non-capital flood-risk management activities and from Defra to local authorities for capital projects to reduce the risk of coastal erosion.

Lord Davies of Oldham: I think that your Lordships would want to express sympathy with all those who suffered so grievously last summer in the devastating flood events. We all know that flooding is one of the most

devastating events that can occur in people's homes and that many suffered then.

The Environment Agency is not held responsible for the problems of last summer. We look to the Environment Agency to deal with coastal erosion problems, which are not part of this debate. The Government are in the closest discussions with the insurance industry to ensure that we provide adequate insurance provision for the future. That requires householders to change attitudes. With major problems, agencies can play their part and the Government have a critical role to play, but we need to condition the public's response and increase awareness of what is necessary so that people can safeguard their properties. We ought to look at agricultural funding so that landowners are more aware of the necessity for water management in the development of their land. Payments to farmers and the structure of the way in which landowners and farmers are remunerated are massive problems.

I am not going to shy away from building on flood plains. There is no way in which we can house our people and pretend that we will not build on flood plains. The issue is how we manage water matters in areas that we create. Due regard must be paid to this dimension of the problem when building new housing. The Government are extremely active in efforts to improve the way in which flood risk is managed. We have been for some years, but we need to increase those efforts. Nevertheless, we intend to increase expenditure in this area, mindful of the fact that the problems require us to address the issues creatively.

Landfill
Question and Written Answer on Thursday 22 May

Dr Fox (Woodspring): To ask the Secretary of State for Environment, Food and Rural Affairs what assessment he has made of the merits of using incineration to reduce use of landfill; and if he will make a statement.

Joan Ruddock: Recovering energy from waste (including via incineration) can offer a considerable climate change benefit compared to the alternative of landfill. This is primarily through avoided landfill methane emissions, with energy generated from the biodegradable fraction of waste also offsetting fossil fuel power generation.

While incineration is preferable to landfill, this should not displace waste from management further up the hierarchy (eg minimisation, reuse, recycling/composting).

Health

Chronic Fatigue Syndrome: Research
Question and Written Answer on Monday 21 April

Mr Maude (Horsham): To ask the Secretary of State for Health if he will establish an independent scientific committee to oversee research into myalgic encephalomyelitis/chronic fatigue syndrome.

Ian Pearson: I have been asked to reply.

There are currently no plans to establish an independent scientific committee to oversee research into myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS). However, the Medical Research Council (MRC) is planning to set up a panel of experts from different disciplines to look more closely at the area. The panel will come from varied fields including neuroscience, immunology, toxicology and imaging, and will involve interested parties and focus on the subtypes and causes of ME/CFS.

Mr Maude: To ask the Secretary of State for Health if he will take steps to ensure that Government funding for biomedical research on ME/CFS is equal to Government funding for psychological research on Myalgic Encephalomyelitis/Chronic Fatigue Syndrome.

Ian Pearson: I have been asked to reply.

The Medical Research Council (MRC) is committed to funding scientific research into all aspects of myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) including evaluations of other treatments and studies into the biological and psychological basis of the condition. The amount provided by the MRC to each type of research depends on the quality and number of proposals received.

Allergy (Science and Technology Committee Report)
Debate in the House of Lords on Thursday 8 May

Baroness Finlay of Llandaff rose to move that the House takes note of the report of the Science and Technology Committee on Allergy (6th Report, Session 2006-07, HL Paper 166). The report and its recommendations have been warmly received in the allergy community by professionals and patients alike and extensively covered in the media. Several authoritative reviews of clinical allergy services preceded the report, and all of them noted serious deficiencies. As the inquiry developed, it became shockingly apparent just how severely allergic diseases could impair people's quality of life and how, despite a track record of high-quality research in the field, allergy services in the UK lag far behind those of other European countries through a severe shortage of allergy specialists.

There are only 26.5 whole time-equivalent allergy specialists, many of whom are clinicians funded through research rather than the NHS, compared with several hundred specialists in some European countries. Of the 94 allergy clinics in England, only six are led by a full-time allergist. The others are uni-disciplinary clinics, which are held a couple of times a week and led by organ-specific specialists working in relative isolation. Pitifully few services of any sort are available in the north and west.

The lack of allergy-service infrastructure is mirrored by a serious lack of allergy knowledge amongst clinicians at all levels, particularly in primary care. Even when a GP recognises that a patient needs to be referred, it is hard to identify who to refer to, and some patients resort to

attempting self-diagnosis using inappropriate and unproven tests. Furthermore, the answer to better diagnosis in primary care is not pedalling diagnostic kits, but education, education, education, because misleading false positives abound without an accurate history and a proper clinical examination.

Lord Haskel: Perhaps we were at fault in addressing our concerns to the Department of Health. Allergy issues are much broader than that. The Government's response includes contributions from other departments: business, regulation, children and families, communities, local government, environment, food, work and pensions, health and safety. It is a very broad topic. That is why so many people are aware of it and why so many of them are concerned. Will the Minister look at this report again, not from the point of view of administration, but from the point of view of a Government who are in touch with the public, listen to their concerns and want to know what is being done by all those different parts of government to deal with those concerns?

The Earl of Selborne: The most startling thing of all is that we do not seem to know why the incidence of allergy and allergic disease is rising. It is clearly linked to some aspect of the more prosperous living conditions we have enjoyed since the 1960s. Dramatic increases were seen between 1964 and 1980, and there have been continuing increases since then. In Germany following reunification, and in other parts of Eastern Europe, there has been an increase in the incidence of allergic diseases right across the former Iron Curtain countries. It seems that there is a critical window of exposure in the first year of life during which the child's immune system can be influenced, and their risk of allergic disease substantially reduced. Yet once children pass their first birthday, the same factors that would have prevented them from becoming allergic no longer operate, implying that any intervention to change the prevalence of allergy would have to target that very early phase of life and not be brought in some five years later.

Lord May of Oxford: This Select Committee report is particularly timely and it produced a thorough, thoughtful and constructive review of the rising incidence of allergies in the United Kingdom and produced a set of constructive and sensible recommendations. The Government's response is disappointing in parts and in some cases dismissive and I also ask for the report to be read again, recognising that it contains important comments expressed thoughtfully by a lot of well informed people.

The Parliamentary Under-Secretary of State, Department of Health (Lord Darzi of Denham): I am a hay fever sufferer and, for years, living from April to July has always been hell. Allergies affect the lives of millions of people in this country. Around one third of the population suffers from an allergy at some point in their lives. The establishment of the All-Party Parliamentary Group on Allergy will help us make further progress. Allergies are common and on the increase. In addition to the obvious health effects, allergic reactions can make unavoidable daily activities very difficult. They can compromise a sufferer's performance at work and hinder children's educational progress. Clearly, allergic conditions represent a huge challenge, not just for our healthcare system, but for society as a whole. It is for these reasons that the Government welcomed the committee's report, which highlighted very clearly that allergy is an issue that needs to be addressed by a wide range of stakeholders. The Department of Health published a report of its review on allergy services. The review looked at the epidemiology of allergic conditions; the demand for, and provision of, treatments; and the effectiveness of interventions. This review was a crucial first step in building a programme of improvements that would be based on sound evidence, and would reflect the views of patients and healthcare providers. Our review concluded that one key lever for changing allergy services in future will be local rather than national action. Due to the pressure of time today, it will not be possible to run through every recommendation and all the actions that have been taken. The most important ones are as follows:

A lead Strategic Health Authority (SHA) should develop a pilot allergy centre on a hub-and-spokes model. Professor Sir Bruce Keogh, the recently appointed NHS medical director, has written to the 10 SHAs inviting them to take an interest in this important matter. Manchester will be a strong contender.

Five centrally funded training posts for allergy and five for immunology were created last year. The workforce review team will be reminded of the need for increasing training numbers in relation to allergy as part of its annual review programme.

We encouraged the royal colleges to work with other bodies responsible for medical training to enhance the knowledge and expertise of those working with people with allergies. Deaneries and trusts have been asked to consider the need to commission more local training posts for allergy.

Skills for Health have been commissioned to work with stakeholders to develop national occupational standards for allergy for the UK in order to improve the quality and consistency of patient care.

The Royal College of Paediatrics and Child Health has been commissioned to scope and develop care pathways for children with allergy symptoms to ensure that children with allergic reactions are given timely and appropriate care.

The Medical Research Council and the Food Standards Agency are collaborating to fund a clinical intervention study on the effects of early weaning on food allergy. The National Institute for Health Research (NIHR) has provided £4.7 million over five years for research on asthma and allergy and funded a project on primary prevention of asthma by allergen avoidance in infancy.

The National Institute for Health and Clinical Excellence has also produced appraisals of allergic conditions and

clinical guidelines for atopic eczema. We are and will be working with NICE to develop more focused allergy topic proposals.

The Food Standards Agency (FSA) workshops raise awareness of food allergy issues among enforcement officers. The evidence base on avoidance of peanuts in early life and the subsequent development of peanut allergy has changed since the Government issued advice in 1998. The FSA has commissioned a review of the scientific evidence that has become available since that time.

National Institute for Health and Clinical Excellence
Debate in Westminster Hall on Thursday 8 May

Mr Kevin Barron (Rother Valley): We found that in the eight years since it was established, in response to internal and external review, NICE has shown itself ready to change. Initially, it appraised technologies, mainly medicines, and produced clinical guidelines. Its remit was soon expanded to cover interventional procedures. Subsequently, technology appraisals were made mandatory and the single technology appraisal was established to speed up the evaluation process. Since 2004, it has also examined public health issues. It is in no way an organisation that has been static since it was set up. Indeed, it has responded positively to many issues.

NICE is carrying out many of its functions effectively. However, NICE also has its critics, which is one of the reasons we undertook the inquiry. We examined three main areas of concern – the evaluation process, the affordability of guidance and implementation. In addition, after the Office of Fair Trading report on the pharmaceutical price regulation scheme, we decided to consider NICE's potential role in such a new system.

We identified several problems with the evaluation process. The first is topic selection. Only a few selected medical technologies are chosen as suitable for assessment as technology appraisals. There is also far too little emphasis on disinvestment. Because NICE selects what it assesses, we might be able to disinvest more than we do. The wider benefits of treatment to society – for example, issues involving the cost of carers – are not included in NICE's cost-benefit analyses.

We made a number of recommendations to address the problems. Key among them was that a system is needed under which all medicines are assessed at launch. In order to ensure that NICE has the information that it needs, it should have access to the same material used by the licensing body, clinical trials should be registered and NICE and the pharmaceutical industry should work more closely. We recommended that more be done to encourage disinvestment. No evaluation of older, possibly cost-ineffective therapies has taken place to date, although two are under way. We also recommended that the legislation be changed to accommodate the need to ensure that assessments of products take account of the wider benefits to society.

The Minister of State, Department of Health (Dawn Primarolo): I welcome the Committee's broad support for NICE and the important work that it undertakes, and I certainly want to add to the compliments about the excellent work that NICE does. I want to take us back to the time before NICE, when there was a lack of transparency and accountability and a variable local health service. For most of the time, patients were lucky if they could find anything out in the first place. NICE is about providing guidance to the national health service and clinicians on the clinical and cost-effectiveness of new treatments.

A constructive, productive working relationship with the pharmaceutical industry is vital. NICE should adopt a shorter and faster provisional appraisal process to enable it to publish guidance on all new treatments at the time of launch, proceeding to a more detailed appraisal once more evidence is available. NICE has established an international reputation for the thoroughness of its appraisal process and for the consultative approach that it takes in the development of guidance, which includes an opportunity for anyone registered as a stakeholder to appeal against the appraisal committee's decisions.

We also introduced new topic selection arrangements in 2006, which give NICE a greater role in the early stages of topic selection. They are intended to ensure that important new drugs and other technologies are more consistently identified at an early stage. Even more recently the cancer reform strategy, published in December 2007, proposed the default position that all new cancer drugs should be referred to NICE for appraisal, if there is sufficient evidence and a large enough patient population. Although the principal aim of that measure is to improve equity of access to cancer treatments, I have recently agreed a change to the topic selection process for cancer topics, which should have the additional benefit of speeding up the referral process.

Liver Disease
Debate in Westminster Hall on Wednesday 21 May

Dr Brian Iddon (Bolton, South-East): We have only one liver, and it is a vital organ. It processes all our waste metabolic products after the body has abstracted the vital carbohydrates, fats and proteins and the essential vitamins and minerals on which our life depends. If it begins to fail, a backlog of toxic chemicals throughout our system causes us all sorts of problems, and multiple organ failure results in death if those toxic products are not removed. We cannot ignore that vital organ – it is precious and we have only one.

Liver disease is caused by inflammation of the liver, or hepatitis, which can be provoked by alcohol or other drugs or by various viruses. It can also be provoked by antibodies directed at the liver. That is called auto-immune liver disease, and it predominates in women and is possibly genetically linked. Other causes of liver disease are excessive iron or fat deposition in the liver and a variety of much rarer diseases that are difficult to detect. Inflammation can become chronic and progress through

cirrhosis of the liver, which is a scarring of the tissue, otherwise known as fibrosis, and has a high mortality rate, to cancer of the liver.

A number of viruses affect the liver, the most common being hepatitis A, B, C, D and E. Only B, C and D can cause long-term disease, and the hepatitis D virus can survive in our bodies only if we are also infected with the hepatitis B virus. Carriers of those viruses might not exhibit symptoms of the disease, and indeed they can be carried for long periods. There are simple tests to detect them, which can be followed by a liver function test if necessary, and even by a liver biopsy, which is not a pleasant procedure, or a less interventional procedure known as ultrascan.

There is a staggering 500 per cent projected increase in demand for liver transplantation in the next six to 10 years, which is a very short time span, and a similar projected increase in the incidence of liver cancer. Even with a vigorous organ donation campaign, there will not be enough livers to save all the lives that will be at risk. That is one reason why I have supported stem-cell research, which might allow us to grow tissues in the laboratory for the repair of organs such as the liver. Some 38 people die from liver disease every day in this country, and 100 people on the waiting list for liver transplants die every year. The huge shortage of livers for transplantation means that early diagnosis and treatment of liver disease is a far better option.

A further reason for my interest in the debate comes from my interest in the misuse of drugs. Whether they are controlled, prescription or over-the-counter drugs makes no difference. I am the chairman of the all-party group on drugs misuse. Some 80 per cent of those who contract the hepatitis C virus, which I shall call HCV, do so as a result of injecting drugs and sharing syringes and other paraphernalia with other people. That is particularly the case in prisons, where we could do much more to prevent the spread of blood-borne diseases. Anyone in contact with the blood of an HCV or hepatitis B carrier is likely to pick up the viruses, as they are readily transmitted through contact with blood.

We chose to request the debate this week because it is national tackling drugs week – I shall be spending some time with the co-ordinator of our drug and alcohol team in Bolton on Friday – and because last Monday, 19 May, was the first ever world hepatitis day. It involved 200 patient groups in 15 countries and was co-ordinated by the Hepatitis C Trust, helped by all the organisations with an interest in liver disease.

The Parliamentary Under-Secretary of State for Health (Mr. Ivan Lewis): The Government recognise the importance of liver disease as a public health issue, and the need to ensure that we have appropriate services in place to prevent, diagnose and treat its various forms. As we heard, liver disease is the fifth most common cause of death in this country, for both men and women. It is the only one of the big killers for which the mortality rate is steadily rising. The United Kingdom is the only major developed nation with an upward trend in mortality and we need to understand why.

In principle, liver disease is almost entirely preventable. The Government are concerned about the increasing incidence of and mortality from liver disease. A substantial programme of work is already ongoing to tackle liver disease and its main causes, which are alcohol, viral hepatitis, and obesity. In addition, we are considering the development of a specific programme of work on liver disease to cover health promotion as well as the full range of health services. To inform those decisions, officials have undertaken preliminary work on a range of things, including commissioning a rapid critical review of existing evidence on liver disease epidemiology, treatment and services; asking an ad-hoc group of experts chaired by Professor Ian Gilmore of the Royal College of Physicians to produce an overview report of clinical issues; and holding a series of informal meetings with key stakeholder individuals and groups.

That preliminary work culminated in a one-day workshop last week that was attended by health service commissioners, clinicians and representatives of patient organisations. The participants were asked to identify and prioritise areas for future action. It will be no surprise that the top suggestion was for an action plan or national strategy for liver disease—all contributors to the debate mentioned that.

Dr Ian Gibson (Norwich North): Does my hon Friend agree that liver disease as a cancer is part of the reformed cancer strategy? It is sometimes described as a rarer cancer, but, nevertheless, prevention is part of the reformed strategy. It should be inclusive and there should be joined-up thinking about the causes that lead eventually to cancer.

Mr Lewis: I agree entirely. The cancer strategy would be less than effective if we did not recognise the direct links between the two. If we develop a national liver disease strategy, a relationship between those two things would be essential. More generally, we are concerned about the increasing incidence of, and mortality from, alcohol-related liver disease, and we are committed to tackling the problem. Identifying harmful drinkers as early as possible will help to avoid the serious damage that harmful drinking has on the health of the individual. Drinking also has a major impact on the wider community and society. We are all concerned about antisocial behaviour, which is increasingly fuelled by alcohol abuse, in our local communities.

The Government are also investing £650,000 in training which could, within 10 years, produce 60,000 new doctors trained to identify and advise or treat people who are drinking too much. Independent reviews into evidence of the relationship between the pricing and promotion of alcohol and harm, and unit labelling, including advice to women on alcohol and pregnancy, are under way. The reviews will form the basis of a public consultation later in the year and may require legislation in future.

NHS Infectious Diseases
Question and Written Answer on Thursday 22 May

Philip Davies (Shipley): To ask the Secretary of State for Health what his Department's procedure is for the introduction of new infection control technologies in the NHS following a recommendation from its Rapid Review Panel.

Ann Keen: The Rapid Review Panel (RRP) was set up in 2004 to review new health care associated infection related technologies. The RRP provides a prompt assessment of new and novel equipment, materials, and other products or protocols that may be of value to the national health service in improving infection prevention and control. The RRP has already reviewed over 200 products, providing feedback and opinion in one of seven categories, with recommendation 1 being the highest category where the efficacy of a product has been proved scientifically and in use.

A wide range of new programmes is being implemented to support the RRP as a consequence of the Healthcare Associated Infection Technology Innovation Programme launched in the "Clean, safe care" strategy (January 2008). Technologies with a RRP recommendation 1 are being placed in showcase hospitals around the country for periods up to six months for the purpose of evaluating in-use features and providing feedback to the NHS in the form of ready made adoption business cases. Such technologies are also subject to an accelerated placement in the NHS Supply Chain catalogue.

Uptake will be reviewed through information provided by the NHS Supply Chain where this is appropriate. Plans are also being developed to provide support to technologies that have RRP Panel two and three recommendations.

International Development

International Development (Sanitation and Water)
Debate in Westminster Hall Thursday 1 May

Malcolm Bruce (Gordon): I am glad to have the opportunity to debate the Sixth Report from the International Development Committee, Session 2006-07, HC126-I, and the Government's response, HC854. It would be an appropriate outcome of the debate to get information from the Minister on how the Department for International Development is moving forward on the issues of sanitation and water. The Department had indicated that it would publish a paper, and perhaps he will give us a timetable for that in his response.

Mr Geoffrey Clifton-Brown (Cotswold): I want to point out that the Government say in their response that they will produce a policy update by the end of 2007. Four months on, that policy update has not been produced, as far as I am aware. Too often in the House, Select Committees produce reports on issues that they never revisit. Will the Chairman of the Committee give an undertaking that he will at least consider revisiting the subject at the end of this year or next year to see what action the Government have taken as a result of the report?

Malcolm Bruce: I want to stress that the Committee felt that it had a contribution to make by placing the emphasis on sanitation. Water is always talked about, but sanitation is often an add-on; it is the second part of "Water and Sanitation". Water is delivered by Environment or Public Works Ministers, and it is a civil engineering project, but health, education and other Departments should lead on sanitation. There needs to be a cross-departmental, integrated approach to bring those things together.

Sanitation is part of millennium development goal 7, but many of the other MDGs depend on the delivery of good sanitation. It is a fact – this problem, of course, relates to water as well – that many girls will not go to school because of poor sanitation. Even if they go to school, it has been reported to us that teenage girls who are menstruating will not go, because it is all too difficult. They stay away for at least one week a month, and in some cases they stay away altogether. In addition, girls are often the key fetchers of water. Poor sanitation in schools and the requirement for girls to fetch water from some distance away are two factors that combine to keep them away from school, diminishing performance on another MDG.

The Parliamentary Under-Secretary of State for International Development (Mr Gareth Thomas): I welcome the opportunity to debate the IDC's report. Governance is the central problem that has constrained development in the past. It is why the Government continue to give as much attention as we do to governance in developing countries; why we made it the central feature of the 2006 White Paper, "Eliminating World Poverty: making governance work for the poor"; and why we established a £130 million fund on governance and transparency. I am sure that all hon Members will be pleased to know that WaterAid, which does excellent work in this area alongside a series of other NGOs, has received from the fund a further £5 million for work on governance in water sectors around the world.

We are at a critical stage, not only for the water and sanitation MDGs, but the MDGs more generally. That is why the Prime Minister talks of there being an MDG emergency and has sought, through the UN, to make 2008 a year of action on the MDGs. If we are to reach the MDGs on water and sanitation, we need to get water to an extra 300,000 people each day and better sanitation to an extra 450,000 people each day.

Mr Cash (Stone) Does the Minister agree that it would be a good idea to encourage the World Service, and the BBC more generally, in that regard?

Mr Thomas We should not downplay the importance of Parliament as a vehicle for discussion. However, I suspect that I am expressing a view held by all hon Members when I say that we would like the media to give even more serious attention to the debates that we have – not

only the debates on the Floor of the House, but those in Westminster Hall. No doubt BBC Parliament will have the opportunity to look at our proceedings in due course, and that is helpful. There will be a focus on the MDGs at a UN summit on 25 September this year, so there will be an opportunity for the world's media, not just the BBC, to focus on progress that is being made towards meeting all the MDGs. The G8 meeting in July will provide a further opportunity for attention to be focused on the issues.

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/cmwib.htm

Parliamentary and Scientific Committee News

New Member

We are delighted to welcome **Lord Krebs** as a member of the Committee.

Membership Survey

The officers are very grateful to all those members who took part in the recent Membership Survey. The full report is available in the Discussion Forum on the Committee's website www.scienceinparliament.org.uk – log in using the members' password and go to Forum.

Points from the Executive Summary of the report are set out below:

Awareness

Members of the Committee have high awareness of Committee activities with 96% of respondents aware; indicating the regard that they hold for its existence.

Value

The value of the Committee to its members is very high, with over 75% of Parliamentarians and 58% of other members agreeing very strongly that there is value in the current activities that the Committee offers.

Key Beneficial Activities

Forum for Parliamentarians, academia & industry: 79% of respondents agreed that this was of most benefit to them as members, providing them with the opportunity to integrate and come together in this forum.

Informal Networking: This appeared the most popular amongst industrial and university members, indicating their need to network with other Committee members.

Evening Meetings and Debates: Industrial members favoured these most, with 61% of this category ranking highly – either a 4 or 5 in benefit. However location and timings of these events do pose issues for many members. A consideration could include rotating these events across UK establishments.

Visits to Scientific Organisations: Time constraints appear a key factor in attracting members to these visits. It is suggested that frequency of visit is considered, as visits are not regarded as a key benefit for members at present.

High Profile Speakers: 63% of all respondents agreed that these are a great benefit to them as members, highlighting the importance of attracting such individuals to Committee events.

Annual Lunch: The annual lunch is regarded highly by just under a third of all respondents. Parliamentarians favoured this event the most. A closer look at the format of this event may well encourage more members to attend.

Science in Parliament Magazine: This is received very well by over half of all members. The articles and insight provide members with excellent information, however there is still some room for improvement with the publication.

Area of Science that Interests Members Most
The Environment was cited as an area of key interest by members, with 123 out of 184 (67%) respondents interested in this topic. Biology and Medicine came second and third respectively with 105 (57%) and 103 (55%) members interested in these scientific areas.

Attendance at Committee Meetings
78% of members who responded confirmed that they have attended a Committee meeting.

Non-Attendance
The members surveyed who had not attended cited time of day and diary clashes as the main reason. Relevance of topic is also key to attendance.

Improving Committee Meetings
In general, the format and length of meeting seems popular with members. The key factor determining whether a member will attend is the topic relevance. This will be the hardest to address, due to the diverse organisations and audiences that the Committee appeals to. Consideration of suggested topics may influence even more members to attend.

Annual Event
Attendance: Around half of the members who were surveyed have attended the annual lunch at some time.

Non-Attendance: Some members appeared unaware of the event, (but this may include new members who have not had the opportunity to attend yet). The guest speaker relevance is also key when deciding whether to attend. High profile speakers are likely to attract a wider membership to the annual event.

Format: The luncheon is still the preferred option for members surveyed, but there is some interest in the themed event which could be incorporated into this format. There is also significant interest in an evening occasion, with around a third (32%) of respondents preferring this type of event.

Venue: The most preferred venue is a Parliament building.

Payment: Payment should remain in the £50 - £100 bracket – any significant increase could alienate members.

Timing: Timing preferences were extremely varied, but the most popular month is October, with many members requesting avoidance of the busy December period.

Guest Speaker: The most popular choice appeared to be a high profile scientist, but many members explained that they would be pleased to see a Politician, Commercial Leader or Scientist speak. The possibility of the rotation of speakers could be considered.

Reward for Outstanding Contribution to the Work of the Committee: The suggestion of an award was generally well received, with over half of members (54%) agreeing that this should be featured at the annual event (as long as this was constructed carefully). The format of the event must be taken into account – eg if it remains a luncheon, time constraints must be considered.

Increased Participation of Young Members
32% of members surveyed believe that the most effective way of encouraging new members to attend is by allowing them to display their work. This could be in the form of a 'Young Person's Forum'. Some members feel that the Committee may appear elitist and off-putting to younger members, so offering a less formal setting could break down some of these barriers.

The members also believe that 'hot topics' are key in engaging this younger membership.

Topics and Themes to be covered
Due to the diversity of membership, the suggestions offered varied widely. The full list of suggestions can be seen in the Appendix. 19% of members surveyed wanted to see Environment, Oceans and Climate Change featured in the next 12 months. Medicine, Health and Disease was requested by 15%.

Website
Generally this still has low awareness, with 64% confessing to not using it. Many of those who were surveyed were going to 'take a look' following the survey.

Science in Parliament Magazine
85% of Parliamentarians and 82% of other members surveyed do read this publication.

55% of respondents have high regard for the magazine, with the content praised.

However a large proportion of members commented on the look of the magazine. Many find it old fashioned and dated, especially the font that is used with limited colour, which may not attract a younger readership.

Earthquake in China

At a ceremony at the Chinese Embassy on 21st May, Professor H Peter Jost, on behalf of the Parliamentary & Scientific Committee, expressed the Committee's condolences at the suffering of the people caused by the earthquake in the Sichuan Province, and the Committee's admiration for the prompt action taken by the Chinese government in responding quickly to the needs of the people.

HE Mme Fu Ying, the Ambassador (shown with Dr Jost) expressed her appreciation to the P&S Committee for the sentiments expressed.

Euro-News

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

Bumblebee disease studied

The health of commercial colonies of bumblebees used for pollinating greenhouse crops is in jeopardy due to transportable parasitic infections. To help combat this threat, a European study has analysed the genome of one fungal parasite.

Bumblebees (*Bombus spp)* are very effective pollinators, both commercially and in natural ecosystems. Their feeding activities indirectly promote genetic variation and biodiversity. Moreover, insect pollination is essential for the production of seed from species that rely on outbreeding mechanisms. However, there is evidence that there is a consistent decline in numbers (with possible extinction) in some bumblebee species, which is naturally of concern to conservationists and ecologists.

Bumblebee rearing has developed into a commercial success due to the insect's efficacy in pollinating greenhouse crops. However, development of hundreds of thousands of colonies of bumblebees is bound to be accompanied by an ecological price. One of these is the parasitic disease *Nosema bombi*, a fungal disease that produces spores primarily in the excretory and nervous system of the bee. Apart from physiological effects including diarrhoea and a swollen abdomen, the queen is inhibited from mating and the viability of infected bees decreases.

Colonies of bumblebees are bred worldwide and transported between countries and continents. To avoid introduction of nonendemic species of parasites, it is essential to investigate the genetic make-up of the invader. With commercial interests in mind, together with the future of the European bumblebee population generally, the Pollinator project conducted a study of *Nosema bombi*. The team at Queen's University, Belfast, specifically investigated the genome of the parasite for host-specific variation and possible genetic markers. The scientists created a genomic library to provide DNA regions that could be investigated for their suitability as genetic and phylogeographical markers.

Illuminating results were produced when genetic sequences were isolated from only two spores of the fungus found within one bumblebee. Amplification, cloning and sequencing revealed that there were multiple ribosomal RNA copies that would give rise to different or non-homologous DNA sequences.

The implications of this are that concerted evolution has not produced identical genetic sequences within one spore. Exotic parasite introductions have a habit of creating havoc within established ecosystems. Armed with results of this nature, science may be one step ahead of the genetic evolution of the fungus and more able to control the parasite within commercial populations of the bumblebee.

Funded under the FP5 programme 'Life quality' (Quality of life and management of living resources). Collaboration sought: further research or development support. http://cordis.europa.eu/marketplace > search > offers > 383

Reliability of rural electrification systems

The sustainable development of the world's rural areas involves the provision of a reliable, cost-effective energy source. Accordingly, partners in the Taqsolre project have analysed the reliability of stand-alone photovoltaic (PV) systems.

The electrification of rural areas in developing countries would give people access to a range of energy services previously not available to them. Small systems would power domestic appliances such as lights, television sets, mobile phones and computers. On a community scale, the development of schools and health care would be facilitated. Residential life, farming and irrigation could all be mechanised and upgraded. PV solar energy is considered to be the most promising system to deliver electrification to rural communities. Unfortunately, the introduction of PV systems is hampered by technical, social and economic barriers that tend to limit dissemination of the technology. The scope of the project was therefore broad, but EU-funded Taqsolre aimed to identify the root causes of the problems in a drive to find solutions.

Project partners at Universidad Politécnica de Madrid tackled the issue of dependability of stand-alone PV systems. For reliability of a system, the ability to maintain it and the availability of replacement parts are also relevant. The analysis also took into account the effect of component failure. One innovative approach was inclusion of the effect of loss of power or load probability. To aid the implementation of PV systems, the team also provided a quality reference for the inverter as a guide for users and procurers. The inverter effectively manages the power and creates a flow of supply that is sufficiently strong and consistent. In addition to the reliability criterion, safety, energy performance, ease of use, installation and maintenance were covered. Future targets of research will no doubt build on the progress of systems set up in Latin America, Africa and Asia that are actively using the results of this project. As part of the initiative, the Madrid team set up a practical seminar in Lima for technicians involved in this scheme whose objective was to set up 1,000 solar home systems. The results of the analysis are available and have been targeted towards researchers and systems designers. These have been distributed through peer journals, conferences and a hands-on approach at workshops. For interested parties, a website which gives details of objectives and schemes through a photo gallery can be accessed at: http://www.taqsolre.net

Funded under the FP5 programme EESD (Energy, environment and sustainable development). Collaboration sought: further research or development support. http://cordis.europa.eu/marketplace > search > offers > 382

Science Directory

DIRECTORY INDEX

Aerospace and Aviation
C-Tech Innovation
EPSRC
Semta
National Physical Laboratory

Agriculture
BBSRC
CABI
Campden & Chorleywood Food Research Association
Institute of Biology
LGC
Newcastle University
PHARMAQ Ltd
SCI
Society for General Microbiology
UFAW

Animal Health and Welfare, Veterinary Research
ABPI
Academy of Medical Sciences
British Veterinary Association
Institute of Biology
The Nutrition Society
PHARMAQ Ltd
UFAW

Astronomy and Space Science
Natural History Museum
STFC

Atmospheric Sciences, Climate and Weather
Natural Environment Research Council
Newcastle University
STFC

Biotechnology
BBSRC
Biochemical Society
Biosciences Federation
Campden & Chorleywood Food Research Association
C-Tech Innovation
Institute of Biology
LGC
Lilly
National Physical Laboratory
Newcastle University
Plymouth Marine Sciences Partnership
Royal Society of Chemistry
SCI
Society for General Microbiology

Brain Research
ABPI
Lilly
Newcastle University

Cancer Research
ABPI
Lilly
National Physical Laboratory
Newcastle University

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

Chemistry
C-Tech Innovation
EPSRC
Institution of Chemical Engineers
LGC
London Metropolitan Polymer Centre
Newcastle University
Plymouth Marine Sciences Partnership
Royal Institution
Royal Society of Chemistry
SCI
STFC

Colloid Science
London Metropolitan Polymer Centre
Royal Society of Chemistry

Construction and Building
EPSRC
Institution of Civil Engineers
London Metropolitan Polymer Centre
National Physical Laboratory
Newcastle University
SCI

Cosmetic Science
Society of Cosmetic Scientists

Earth Sciences
Institute of Biology
Natural England
Natural History Museum
Newcastle University

Ecology, Environment and Biodiversity
AMSI
The British Ecological Society
CABI
Economic and Social Research Council
Freshwater Biological Association
Institute of Biology
Institution of Chemical Engineers
Institution of Civil Engineers
Kew Gardens
LGC
National Physical Laboratory
Natural England
Natural Environment Research Council
Natural History Museum
Newcastle University
Plymouth Marine Sciences Partnership
Royal Society of Chemistry
SCI
Society for General Microbiology

Economic and Social Research
Economic and Social Research Council
Newcastle University

Education, Training and Skills
ABPI
Academy of Medical Sciences
Biosciences Federation
British Association for the Advancement of Science
The British Ecological Society
British Nutrition Foundation
British Pharmacological Society
British Society for Antimicrobial Chemotherapy
CABI
Campden & Chorleywood Food Research Association
Clifton Scientific Trust
C-Tech Innovation
Economic and Social Research Council
EPSRC
The Engineering and Technology Board
Institute of Biology
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
Newcastle University
Plymouth Marine Sciences Partnership
Royal Institution
The Royal Society
Royal Society of Chemistry
Royal Statistical Society
Semta

Energy
C-Tech Innovation
EPSRC
Institute of Physics
Institution of Chemical Engineers
Institution of Civil Engineers
Institution of Engineering and Technology
Newcastle University
Plymouth Marine Sciences Partnership
Royal Society of Chemistry
SCI
STFC

Engineering
C-Tech Innovation
EPSRC
The Engineering and Technology Board
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
SCI
Semta
STFC

Fisheries Research
AMSI
Freshwater Biological Association
Institute of Biology
Plymouth Marine Sciences Partnership

Food and Food Technology
Biosciences Federation
British Nutrition Foundation
CABI
Campden & Chorleywood Food Research Association
C-Tech Innovation
Institute of Biology
Institution of Chemical Engineers
LGC
Newcastle University
The Nutrition Society
Royal Society of Chemistry
SCI
Society for General Microbiology

Forensics
LGC
Royal Society of Chemistry

Genetics
ABPI
BBSRC
HFEA
Institute of Biology
LGC
Natural History Museum
Newcastle University

Geology and Geoscience
AMSI
Institution of Civil Engineers
Natural Environment Research Council

Hazard and Risk Mitigation
Health Protection Agency
Institution of Chemical Engineers
Institution of Civil Engineers

Health
ABPI
Academy of Medical Sciences
Biochemical Society
Biosciences Federation
British Nutrition Foundation
British Pharmacological Society
British Society for Antimicrobial Chemotherapy
Economic and Social Research Council
EPSRC
Health Protection Agency
HFEA
Institute of Biology
Institute of Physics and Engineering in Medicine
LGC
Lilly
Medical Research Council
Merck Sharp & Dohme
National Physical Laboratory
Newcastle University
The Nutrition Society
Royal Institution
Royal Society of Chemistry
Society for General Microbiology

Heart Research
ABPI
Lilly

Hydrocarbons and Petroleum
Natural History Museum
Newcastle University
Royal Society of Chemistry

Industrial Policy and Research
AIRTO

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

Information Services
AIRTO
CABI

IT, Internet, Telecommunications, Computing and Electronics
EPSRC
Institution of Civil Engineers
Institution of Engineering and Technology
National Physical Laboratory
Newcastle University
STFC

Intellectual Property
ABPI
The Chartered Institute of Patent Attorneys
C-Tech Innovation
Lilly
NESTA
Newcastle University

Large-Scale Research Facilities
Campden & Chorleywood Food Research Association
C-Tech Innovation
London Metropolitan Polymer Centre
National Physical Laboratory
Natural History Museum
STFC

Lasers
National Physical Laboratory
STFC

Manufacturing
ABPI
AMSI
EPSRC
London Metropolitan Polymer Centre
National Physical Laboratory
SCI

Materials
C-Tech Innovation
EPSRC
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
HFEA
Institute of Biology
Lilly
Medical Research Council
Merck Sharp & Dohme
Newcastle University
Plymouth Marine Sciences Partnership
UFAW

Motor Vehicles
London Metropolitan Polymer Centre
Semta

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
Institute of Biology
Institution of Chemical Engineers
LGC
Lilly
Merck Sharp & Dohme
PHARMAQ Ltd
Royal Society of Chemistry
SCI

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

Physics
Cavendish Laboratory
C-Tech Innovation
EPSRC
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
Newcastle University
Plymouth Marine Sciences Partnership

Psychology
British Psychological Society

Public Policy
Biosciences Federation
The British Ecological Society
British Nutrition Foundation
British Society for Antimicrobial Chemotherapy
Economic and Social Research Council
The Engineering and Technology Board
HFEA
Institute of Biology
Institution of Civil Engineers
NESTA
Prospect

Public Understanding of Science
Academy of Medical Sciences
Biochemical Society
British Association for the Advancement of Science
The British Ecological Society
British Nutrition Foundation
British Society for Antimicrobial Chemotherapy
Clifton Scientific Trust
EPSRC
The Engineering and Technology Board
HFEA
Institute of Biology
Institute of Physics
Institution of Chemical Engineers
Institution of Engineering and Technology
Medical Research Council
NESTA
Newcastle University
Plymouth Marine Sciences Partnership
Prospect
Research Councils UK
Royal Academy of Engineering
Royal Institution
The Royal Society
Royal Society of Chemistry
STFC

Quality Management
Campden & Chorleywood Food Research Association
LGC
National Physical Laboratory

Radiation Hazards
Health Protection Agency
LGC

Retail
Marks and Spencer

Science Policy
ABPI
Academy of Medical Sciences
Biochemical Society
Biosciences Federation
British Association for the Advancement of Science
The British Ecological Society
British Nutrition Foundation
British Pharmacological Society
CABI
Clifton Scientific Trust
Economic and Social Research Council
EPSRC
The Engineering and Technology Board
HFEA
Institute of Biology
Institute of Physics
Institution of Chemical Engineers
Institution of Civil Engineers
LGC
Lilly
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
Semta
STFC
UFAW

Seed Protection
CABI

Sensors and Transducers
AMSI
C-Tech Innovation
STFC

SSSIs
Kew Gardens
Natural England

Statistics
EPSRC
The Engineering and Technology Board
Royal Statistical Society

Surface Science
C-Tech Innovation
STFC

Sustainability
Biosciences Federation
The British Ecological Society
CABI
C-Tech Innovation
EPSRC
Institute of Biology
Institution of Chemical Engineers
Institution of Civil Engineers
London Metropolitan Polymer Centre
Natural England
Newcastle University
Plymouth Marine Sciences Partnership
SCI

Technology Transfer
CABI
Campden & Chorleywood Food Research Association
C-Tech Innovation
LGC
London Metropolitan Polymer Centre
NESTA
National Physical Laboratory
Research Councils UK
Royal Society of Chemistry
STFC

Tropical Medicine
Health Protection Agency
Society for General Microbiology

Viruses
ABPI
Health Protection Agency
Society for General Microbiology

Water
AMSI
Campden & Chorleywood Food Research Association
C-Tech Innovation
Freshwater Biological Association
Institute of Biology
Institution of Chemical Engineers
Institution of Civil Engineers
LGC
Plymouth Marine Sciences Partnership
Royal Society of Chemistry
SCI
Society for General Microbiology

Wildlife
Biosciences Federation
The British Ecological Society
Institute of Biology
Natural England
Natural History Museum
UFAW

Research Councils UK

Contact: Alun Roberts
Communications Manager
Research Councils UK
Polaris House
North Star Avenue
Swindon SN2 1ET

Tel: 01793 444474
E-mail: alun.roberts@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

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 £100 million from the Government to support research and postgraduate study in the arts and humanities, from archaeology and English literature to dance and design. Awards are made after a rigorous peer review process, to ensure 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

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

The BBSRC is the UK's leading funding agency for academic research in the non-medical life sciences and is funded principally through the Government's Science Budget. It supports staff in universities and research institutes throughout the UK, and funds basic and strategic science in: agri-food, animal sciences, biomolecular sciences, biochemistry and cell biology, engineering and biological systems, genes and developmental biology, and plant and microbial sciences.

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 Fax 01793 413130
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 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.

Engineering and Physical Sciences Research Council

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

EPSRC invests more than £740 million a year in research and postgraduate training in the physical sciences and engineering, to help the nation handle the next generation of technological change. The areas covered range from mathematics to materials science, and information technology to structural engineering.

We also actively promote public engagement with science and engineering, and we collaborate with a wide range of organisations in this area.

Medical Research Council

Contact: Simon Wilde
20 Park Crescent, London W1B 1AL.
Tel: 020 7636 5422 Fax: 020 7436 2665
E-mail:
simon.wilde@headoffice.mrc.ac.uk
Website: www.mrc.ac.uk

The Medical Research Council (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

Contact: Nigel Calvin
STFC
Polaris House
North Star Avenue
Swindon SN2 1SZ
Tel: 01793 44 2176 Fax: 01793 44 2125
E-mail: nigel.calvin@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. It also manages international research projects in support of a broad cross-section of the UK research community. The Council also directs, co-ordinates and funds research, education and training.

Association of the British Pharmaceutical Industry

Contact: Dr Philip Wright
Director of Science & Technology
12 Whitehall, London SW1A 2DY
Tel: 020 7747 1408
Fax: 020 7747 1417
E-mail: pwright@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

Association of Marine Scientific Industries

Contact: Karen Gray, Secretary
Association of Marine Scientific Industries
4th Floor, 30 Great Guildford Street
London SE1 0HS
Tel: 020 7928 9199 Fax: 020 7928 6599
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.

The Academy of Medical Sciences

Contact: Mrs Mary Manning, 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.

AIRTO

Contact: Professor Richard Brook
AIRTO Ltd: Association of Independent Research & Technology Organisations Limited
c/o CCFRA, 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 in the region of £1.5 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.

Biochemical Society

Contact: Dr Chris Kirk
Chief Executive,
16 Procter Street, London WC1V 6NX
Tel: 020 7280 4133 Fax: 020 7280 4170
Email: chris.kirk@biochemistry.org
Website: www.biochemistry.org

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.

BIOSCIENCES FEDERATION

Contact: Dr Richard Dyer, Chief Executive
Biosciences Federation
PO Box 502, Cambridge, CB1 0AL
Tel: 01223 400181
Fax: 01223 246858
E-mail: rdyer.bsf@physoc.org
Website: www.bsf.ac.uk

The Biosciences Federation is a single authority representing the UK's biological expertise. The BSF directly represents 51 bioscience organisations, and contributes to the development of policy and strategy in biology-based research – including funding and the interface with other disciplines – and in school and university teaching by providing independent opinion to government.

British Association for the Advancement of Science - the BA

Contact: Sir Roland Jackson Bt, Chief Executive
The BA, Wellcome Wolfson Building,
165 Queen's Gate, London SW7 5HD.
E-mail: Roland.Jackson@the-BA.net
Website: www.the-BA.net

The BA (British Association for the Advancement of Science) exists to advance the public understanding, accessibility and accountability of the sciences and engineering. The BA aims to promote openness about science in society and to engage and inspire people directly with science and technology and their implications.

Established in 1831, the BA is a registered charity which organises major initiatives across the UK, including the annual BA Festival of Science, National Science and Engineering Week, programmes of regional and local events, and the CREST programme for young people in schools and colleges.

The British Ecological Society

Contact: Ceri Margerison, Policy Officer
British Ecological Society
26 Blades Court, Deodar Road, Putney, London, SW15 2NU
Tel: 020 8877 0740 Fax : 020 8871 9779
Website: www.BritishEcologicalSociety.org
Ecology into Policy Blog
http://ecologyandpolicy.blogspot.com/

The British Ecological Society's mission is to advance ecology and make it count. The Society has 4,000 members worldwide. The BES publishes four 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: c.price@nutrition.org.uk
Website: www.nutrition.org.uk

2007 was the 40th Anniversary of the British Nutrition Foundation. This scientific and educational charity promotes the well-being of society through the impartial interpretation and effective dissemination of scientifically based knowledge and advice on the relationship between diet, physical activity and health.

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

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

Contact: Tracey Guest, Executive Officer
British Society for Antimicrobial Chemotherapy
11 The Wharf, 16 Bridge Street,
Birmingham B1 2JS.
Tel: 0121 633 0410
Fax: 0121 643 9497
E-mail: tguest@bsac.org.uk
Website: 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.

BVA British Veterinary Association

Contact:Chrissie Nicholls
7 Mansfield Street, London W1G 9NQ
Tel: 020 7908 6340
E-mail:chrissien@bva.co.uk
www.bva.co.uk

BVA's chief interests are:

* Standards of animal health
* Veterinary surgeons' working practices
* Professional standards and quality of service
* Relationships with external bodies, particularly government

BVA carries out three main functions which are:

* Policy development in areas affecting the profession
* Protecting and promoting the profession in matters propounded by government and other external bodies
* Provision of services to members

CABI

Contact: Dr Joan Kelley,
Executive Director Bioservices, 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.

Campden & Chorleywood Food Research Association

Contact: Prof Colin Dennis, Director-General
CCFRA, Chipping Campden,
Gloucestershire GL55 6LD.
Tel: 01386 842000 Fax: 01386 842100
E-mail: info@campden.co.uk
Website: www.campden.co.uk

An independent, membership-based industrial research association providing substantial R&D, processing, analytical, hygiene, best practice, training, auditing and HACCP services for the food chain worldwide.
Members include growers, processors, retailers, caterers, distributors, machinery manufacturers, government departments and enforcement authorities. Employs over 300; serves over 2,000 member sites; and has a subsidiary company in Hungary. Activities focus on safety, quality, efficiency and innovation. Participates in DTI's Faraday Partnerships and collaborates with universities on LINK projects and studentships, transferring practical knowledge between industry and academia.

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, neutral networks.

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

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

Chartered Institute of Patent Attorneys

Founded 1882 Royal Charter 1891

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. 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 notivation, 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

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

An independent innovation and technology development organisation. Activities range from contract and grant funded research to commercialisation of technology, exploitation of intellectual property, multi-disciplinary innovation consultancy and process and product development.

C-Tech now has almost 40 years experience of the management and delivery of major technology and innovation based business support projects both nationally and regionally.

The Engineering and Technology Board

Contact: Clare Cox
2nd Floor, Weston House
246 High Holborn, London WC1V 7EX
Tel: 020 3206 0434
Fax: 020 3206 0401
E-mail: ccox@etechb.co.uk
Website: www.etechb.co.uk

The Engineering and Technology Board (ETB) is an independent organisation that promotes the vital role of engineers, engineering and technology in our society. The ETB 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.

Freshwater Biological Association

Contact: Dr Michael Dobson, Director.
Freshwater Biological Association, The
Ferry Landing, Far Sawrey, Ambleside,
Cumbria, LA22 0LP, UK.
Tel: 01539 442468 Fax: 01539 446914
www.fba.org.uk info@fba.org.uk
Registered Charity Number : 214440

The FBA welcomes collaboration with Government and Agencies. Founded in 1929 the Association promotes freshwater science through; innovative research, serviced facilities, a programme of meetings, scientific publications, and sound independent advice. The FBA houses one of the world's finest freshwater information resources and is the custodian of long term data sets from sites of scientific significance. Membership is offered on an individual or corporate basis.

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 organisation dedicated to protecting people's health in the United Kingdom. We do this by providing impartial advice and authoritative information on health protection uses to the public, to professionals and to government.

We combine public health and scientific expertise, research and emergency planning within one organisation. We work at international, national and regional and local levels and have many links with many other organisations around the world. This means we can respond quickly and effectively to new and existing national and global threats to health including infections, environmental hazards and emergencies.

Human Fertilisation and Embryology Authority

Contact: Tim Whitaker
21 Bloomsbury St
London WC1B 3HF
Tel: 020 7291 8200
Fax: 020 7291 8201
Email: tim.whitaker@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.

Institute of Biology

Contact: Prof Alan Malcolm,
Chief Executive
9 Red Lion Court, London EC4A 3EF
Tel: 020 7936 5900
Fax: 020 7936 5901
E-mail: a.malcolm@iob.org
Website: www.iob.org

The biological sciences have truly come of age, and the Institute of Biology is the professional body to represent biology and biologists to all. A source of independent advice to Government, a supporter of education, a measure of excellence and a disseminator of information - the Institute of Biology is the Voice of British Biology.

IOP Institute of Physics

Contact: Public Relations Department
76 Portland Place, London W1B 1NT
Tel: 020 7470 4800
E-mail: public.relations@iop.org
Website: www.iop.org

The Institute of Physics supports the physics community and promotes physics to government, legislators and policy makers.

It is an international learned society and professional body with over 35,000 members worldwide, working in all branches of physics and a wide variety of jobs and professions – including fundamental resarch, technology-based industries, medicine, finance – and newer jobs such as computer games design. The Institute is active in school and higher education and awards professional qualifications. It provides policy advice and opportunities for public debate on areas of physics such as energy and climate change that affect us all.

Institute of Physics and Engineering in Medicine

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.

IChemE

Institution of Chemical Engineers

IChemE is the hub for chemical, biochemical and process engineering professionals worldwide. We are the heart of the process community, promoting competence and a commitment to sustainable development, advancing the discipline for the benefit of society and supporting the professional development of over 27,000 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 Relations 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: Tony Henderson
Institution of Engineering and Technology
Savoy Place, London WC2R 0BL
Tel: 020 7344 8403
E-mail: tonyhenderson@theiet.org
Website: www.theiet.org

The Institution of Engineering and Technology was formed in 2006 by the Institution of Electrical Engineers and the Institution of Incorporated Engineers. The IET has more than 150,000 members worldwide who work in a range of industries. The Institution aims to lead in the advancement of engineering and technology by facilitating the exchange of knowledge and ideas at a local and global level and promoting best practice.

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 activities:

- 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, an international science-based company, is Europe's leading independent provider of analytical and diagnostic services and reference standards. LGC's market-led divisions – LGC Forensics, Life & Food Sciences, Research & Technology and LGC Standards – operate in a diverse range of sectors for both public and private sector customers.

Under arrangements for the office and function of the Government Chemist, LGC fulfils specific statutory duties and provides advice for Government and the wider analytical community on the implications of analytical chemistry for matters of policy, standards and regulation.

LGC has its headquarters in Teddington, South West London, and other UK operations in Bury, Culham, Edinburgh, Leeds, Risley, Runcorn and Tamworth. It also has facilities in France, Germany, Italy, Poland, Spain, Sweden and India.

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.

Lilly and Company Limited

Answers That Matter.

Contact: Dr Karin Briner,
Managing Director,
Eli Lilly & Company, Erl Wood Manor,
Windlesham, Surrey, GU20 6PH
Tel: 01256 315000
Fax: 01276 483307
E-mail:k.briner@lilly.com
Website:www.lilly.com or www.lilly.co.uk

Lilly UK is the UK affiliate of 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.

Marks & Spencer Plc

Contact:
David Gregory
Waterside House
35 North Wharf Road
London W2 1NW.

Tel: 020 8718 8247
E-mail: david.gregory@marks-and-spencer.com

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

We have over 620 UK stores, employing over 75,000 people - 278 stores internationally in 39 countries.

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

MERCK SHARP & DOHME

Merck Sharp & Dohme Research Laboratories

Contact: Dr Tim Sparey
Licensing & External Research, Europe
Hertford Road
Hoddesdon
Herts EN11 9BU
Tel: 01992 452838
Fax: 01992 441907
e-mail: tim_sparey@merck.com
www.merck.com

Merck Sharp & Dohme is a UK subsidiary of Merck & Co Inc a global research-driven pharmaceutical company dedicated to putting patients first. Merck discovers, develops, manufactures and markets vaccines and medicines in over 20 therapeutic categories directly and through its joint ventures. Our mission is to provide society with superior products and services by developing innovations and solutions that improve the quality of life.

The National Endowment for Science, Technology and the Arts

NESTA Making Innovation Flourish

Contact: Nicholas Bojas
Head of Government Relations
1 Plough Place
London EC4A1DE
Tel: 020 7438 2500
Fax: 020 7438 2501
Email: nicholas.bojas@nesta.org.uk
Website: www.nesta.org.uk

NESTA's aim is to transform the UK's capacity for innovation. We work across the human, financial and the policy dimensions of innovation. We invest in early stage companies, inform innovation policy and encourage a culture that helps innovation to flourish. The unique nature of our endowed funds means that we can take a longer term view, and develop ambitious models to stimulate and support innovation that others can replicate or adapt. NESTA works across disciplines, bringing together people and ideas from science, technology and the creative industries.

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: Dr Tom Tew
Chief Scientist
Natural England
Northminster House
Peterborough
PE1 1UA
Tel: 01733 455056
Fax: 01733 568834
Email: tom.tew@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.

Natural History Museum

Contact: Joe Baker
External Relations Manager
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.

Newcastle University

Contact: Dr Douglas Robertson
Newcastle upon Tyne NE1 7RU
Tel: 0191 222 5347 Fax: 0191 222 5219
E-mail: business@ncl.ac.uk
Website: www.ncl.ac.uk

Newcastle University has a well-balanced portfolio of research funding with one of the highest levels of research projects funded by UK Government Departments, as well as a very significant portfolio of FP6 EU activity of more than 140 projects involving some 1,800 partners. A member of the Russell Group, Newcastle University is committed to 'excellence with a purpose' - a commitment it is taking further through the development of Newcastle Science City and as a partner in the N8 group of Northern research-intensive universities.

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 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.no
http://www.pharmaq.co.uk/shop

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

Plymouth Marine Sciences Partnership

Contact: Liz Humphreys
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.

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 102,000 members. 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

As Britain's national academy for engineering, we bring together the country's most eminent engineers from all disciplines to promote excellence in the science, art and practice of engineering. Our strategic priorities are to enhance the UK's engineering capabilities; to celebrate excellence and inspire the next generation; and to lead debate by guiding informed thinking and influencing public policy.

The Royal Institution

Ri The Royal Institution of Great Britain

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 history. It acts as a unique forum for engaging people in scientific debate, and has a UK-wide programme of informal science learning and mathematics enrichment. The building has been closed for the last three years, and will open in summer 2008 when the public will have access to an extended museum, new social spaces and upgraded facilities in the historic lecture theatre. There will also be a new focus for the Davy Faraday Research Laboratories.

The Royal Society

THE ROYAL SOCIETY CELEBRATING 350 YEARS

Contact: Dr Peter Cotgreave
Director of Public Affairs
The Royal Society, 6-9 Carlton House Terrace
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 prepare for 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
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 Sreet, 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 RSS is a leading source of independent advice, comment and discussion on statistical issues. It plays a crucial role in promoting 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, most notably during the passage of the Statistics and Registration Service Act 2007.

semta

Contact: Dr David J Winstanley
Special Advisor for Science
Semta, Wynyard Park House,
Wynyard Park, Billingham, TS22 5TB
Tel: 01740 627021 Mobile: 07973 679 338
E-mail: dwinstanley@semta.org.uk
Website: www.semta.org.uk

Semta (Science, Engineering and Manufacturing Technologies Alliance) is the Sector Skills Council for the science, engineering and manufacturing technology sectors.

Our **mission** is to ensure that our industry partners have the knowledge and skills required to meet the challenges faced by the workforce of the future.

Our sectors account for a significant proportion of the UK economy. There are about 2 million people employed in about 76,000 establishments in the core Science, Engineering and Technology sectors, and currently contributes over £74 billion per annum – about ten per cent – of total UK GDP.

society for general Microbiology

Contact: Dr Faye Stokes
Marlborough House, Basingstoke Road,
Spencers Wood, Reading RG7 1AG.
Tel: 0118 988 1830 Fax: 0118 988 5656
E-mail: f.stokes@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 Chemical Industry

SCI where science meets business

Contact: Andrew Ladds,
Chief Executive
SCI International Headquarters
14-15 Belgrave Square, London SW1X 8PS
Tel: 020 7598 1500 Fax: 020 7598 1545
E-mail: secretariat@soci.org
Website: www.soci.org

SCI is an interdisciplinary network for science, commerce and industry. SCI attracts forward-thinking people in the process and materials technologies and in the biotechnology, energy, water, agriculture, food, pharmaceuticals, construction, and environmental protection sectors worldwide. Members exchange ideas and gain new perspectives on markets, technologies, strategies and people, through electronic and physical specialist conferences and debates, and our published journals , books and the respected magazine *Chemistry & Industry.*

Society of Cosmetic Scientists

FOUNDED 1948 SCS SOCIETY OF COSMETIC SCIENTISTS

Contact: Lorna Weston,
Secretary General
Society of Cosmetic Scientists
G T House, 24-26 Rothesay Road, Luton, Beds
LU1 1QX
Tel: 01582 726661
Fax: 01582 405217
E-mail: ifscc.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

UFAW Established 1926

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 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@pandsctte.demon.co.uk
www.scienceinparliament.org.uk

There will be evening discussion meetings on the following dates, subjects and speakers to be confirmed:

Tuesday 21 October 17.30
Tuesday 18 November 17.30
Tuesday 9 December 17.30
Tuesday 20 January 2009 17.30

The Royal Institution

The Royal Institution's lecture theatre has reopened, and the rest of its refurbished building will open in September 2008. 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.

Saturday 2 August drop in between 11.00 and 16.00
Family fun day

Thursday 7 August 20.00
Star trek II: the wrath of Khan
Film screening

Monday 11 August 19.00
The fiction lab

Saturday 6 September drop in between 11.00 and 16.00
Family fun day

Monday 8 September 19.00
The fiction lab

Thursday 25 September 19.00
Science today, health tomorrow

Friday 3 October 20.00
Advertising - the science of persuasion?
Winston Fletcher

Saturday 4 October drop in between 11.00 and 16.00
Family fun day

Tuesday 7 October 19.00
What on earth happened?
Christopher Lloyd

Friday 10 October 20.00
Secrets of your immune system
Prof Daniel Davis

Friday 24 October 20.00
Neurons, neighbourhoods and the emotional nuclear bomb
Camila Batmanghelidjh

Monday 27 October 19.00
Patterns in the brain
Prof Tipo Aziz and Prof Tamar Flash

The Royal Society

The Royal Society runs a series of events, both evening lectures and two day discussion meetings, on topics covering the whole breadth of science, engineering and technology. All the events are free to attend and open to all.

Highlights in the next few months include:

Monday 29 and Tuesday 30 September (all day)
Talent and autism

All Royal Society lectures are available from the Royal Society website. The collection includes over 200 lectures with speakers including David Attenborough, Ottoline Leyer 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

Royal Society of Edinburgh

22-26 George Street,
Edinburgh EH2 2PQ.
Tel: 0131 240 5000
Fax: 0131 240 5024
events@royalsoced.org.uk
www.royalsoced.org.uk

All events require registration and, unless otherwise indicated, take place at the RSE.

Monday 1 September18.00
Does God Play Dice?
Professor Miles Padgett FRSE

Thursday 11 September Full Day
Computer Predictions for Nature and Society: Should they be Trusted?

Monday 22 September 18.00
Challenges of Road Pricing
Professor Frank Kelly FRS

Monday 29 and Tuesday 30 September Full day
Drugs of the Future for the Elderly

Tuesday 30 September 17.30
Availability of Drugs for the Elderly

The BA

Saturday 6 – Thursday 11 September
BA Festival of Science

The BA Festival of Science, which brings over 350 of the UK's top scientists to discuss the latest developments in science with the public at a different UK location each year, will take place at the University of Liverpool and across the European Capital of Culture. Organised in partnership with the University of Liverpool with support from the Department for Innovation, Universities & Skills, the Liverpool Culture Company and the Northwest Regional Development Agency.

Please see www.the-ba.net/festivalofscience for more information, including an online programme of events.

Royal Pharmaceutical Society of Great Britain

Contact: science@rpsgb.org
www.rpsgb.org

Events are held at the Royal Pharmaceutical Society of Great Britain, London

Thursday 16 October 10.00 – 16.30
Advances in pharmaceutical laboratory efficiency
One-day symposium

Monday 20 – Tuesday 21 October 13.00 - 17.30
FIP Workshop: Special dosage forms – What's new with in vitro drug release?
Pre-satellite workshop to Biointernational conference
Presented by the International Pharmaceutical Federation (FIP) and the Royal Pharmaceutical Society of Great Britain (RPSGB)

Wednesday 22 – Friday 24 October 09.00-13.45

Bio-International 2008: Towards improved harmonization in regulating multisource products
Presented by the International Pharmaceutical Federation (FIP), and the Royal Pharmaceutical Society of Great Britain (RPSGB) in co-operation with the American Association of Pharmaceutical Scientists (AAPS) and the European Federation for Pharmaceutical Sciences (EUFEPS) .

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

SCIENCE IN PARLIAMENT

Published by the Parliamentary and Scientific Committee, 3 Birdcage Walk, London SW1H 9JJ.
Published four times a year. The 2008 subscription rate is £66.80. Single numbers £16.70
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

Typeset and printed by The Bridge Press.



amrc
ASSOCIATION OF MEDICAL RESEARCH CHARITIES

Our members

Action Medical Research
Action on Addiction
Alcohol Education & Research Council, The
Alzheimer's Research Trust
Alzheimer's Society
Arthritis Research Campaign
Association for International Cancer Research
Association for Spina Bifida and Hydrocephalus
Asthma UK
Ataxia - Telangiectasia Society
Ataxia UK
BackCare
Bardhan Research and Education Trust of Rotherham
Beit Memorial Fellowships for Medical Research
Blackie Foundation Trust
Blond McIndoe Research Foundation
Brain Research Trust
Breakthrough Breast Cancer
Breast Cancer Campaign
British Council for Prevention of Blindness
British Heart Foundation
British Liver Trust
British Lung Foundation
British Neurological Research Trust, The
British Occupational Health Research Foundation
British Pain Society, The
British Retinitis Pigmentosa Society
British Scoliosis Research Foundation
British Sjögren's Syndrome Association
British Skin Foundation
BUPA Foundation
Cancer Research UK
CFS Research Foundation
Chest, Heart and Stroke Scotland
Children with Leukaemia
Children's Liver Disease Foundation
Chronic Disease Research Foundation
Chronic Granulomatous Disorder Research Trust
Circulation Foundation (British Vascular Foundation)
Core (The Digestive Disorders Foundation)
Cystic Fibrosis Trust
Deafness Research UK
DEBRA
Diabetes Research & Wellness Foundation
Diabetes UK
Dunhill Medical Trust
EMF Biological Research Trust
Epilepsy Research UK (incorporating Epilepsy Research Foundation and Fund for Epilepsy)
Fight for Sight
Foundation for Liver Research
Foundation for the Study of Infant Deaths
Guy's and St Thomas' Charity
Healing Foundation
Heart Research UK
Huntington's Disease Association
Hypertension Trust
Inspire Foundation
International Spinal Research Trust (Spinal Research)
Juvenile Diabetes Research Foundation
Kidney Research UK
Kids Kidney Research
Lister Institute of Preventive Medicine
Little Foundation
Ludwig Institute for Cancer Research
Marie Curie Research Institute
Mason Medical Research Foundation
Medical Research Scotland (formally Scottish Hospital Endowments Research Trust, SHERT)
Meningitis Research Foundation
Meningitis Trust
Meningitis UK (Registered as Spencer Dayman Meningitis UK)
Migraine Trust
Motor Neurone Disease Association
Multiple Sclerosis Society of Great Britain and Northern Ireland
Muscular Dystrophy Campaign
National Association for Colitis & Crohn's Disease
National Eye Research Centre
National Osteoporosis Society
Neuro-Disability Research Trust
North West Cancer Research Fund
Northern Ireland Chest, Heart and Stroke Association
Northern Ireland Leukaemia Research Fund
Novo Nordisk UK Research Foundation
Nuffield Foundation
Ovarian Cancer Action
Parkinson's Disease Society of the UK
PBC Foundation (UK) Ltd, The
Primary Immunodeficiency Association
Progressive Supranuclear Palsy Association, The
Prostate Cancer Charity, The
Prostate Cancer Research Foundation, The
Psoriasis Association
RAFT - The Restoration of Appearance and Function Trust
Remedi
Research Into Ageing
Roy Castle Lung Cancer Foundation, The
Royal College of Surgeons of England
Samantha Dickson Brain Tumour Trust
Sir Jules Thorn Charitable Trust
Society for Endocrinology
South West Thames Kidney Fund
SPARKS (Sport Aiding Medical Research for Kids)
St Peter's Trust for Kidney, Bladder & Prostate Research
Stroke Association, The
Tenovus
Tommy's The Baby Charity
Tuberous Sclerosis Association
Ulster Cancer Foundation
Wellbeing of Women
WellChild (Registered as The WellChild Trust)
Wellcome Trust, The
Wessex Medical Trust
William Harvey Research Foundation
World Cancer Research Fund
Yorkshire Cancer Research

Association of Medical Research Charities (AMRC)
61 Gray's Inn Road, London WC1X 8TL Tel: 020-7269-8820 Fax: 020-7269-8821 Website: www.amrc.org.uk