Whit 2006

SCIENCE IN PARLIAMENT

Annual Lunch

Science and Society

Hospitals of the Future

Budget Highlights Science

Antarctica Science for Global Problems

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

The March Budget brought more good news along with some surprises. The Chancellor announced an increase in the supply of science teachers for secondary schools of at least 3000 and further promotion of science in schools by opening 250 science clubs. He announced too £1 billion per annum to bring together NHS and MRC R & D, and consultation on the best institutional arrangements to deliver this will be announced before the 2006 Pre-Budget Report in the Autumn of this year. A similar amount of money is to be invested in a new Energy Research Institute.

The Chancellor surprised the STEM community by announcing a consultation on merging the CCLRC with the large facilities operated by the PPARC and on simplification of the funding arrangements for the physical sciences, essentially the end of PPARC.

The "Science for the 21st Century" syllabus, which makes science appear more relevant to pupils' experiences and gives them a chance to discuss controversial subjects, will be rolled out across the country next September. At a meeting that I attended recently in the Palace, teachers paid a tribute to the work of the Science and Technology Select Committees in both Houses for initiating work on this new syllabus.

How is it that, with increasing resources for STEM, we see continued closures of departments in universities, the latest announcement being a proposal to close the Chemistry Department at Sussex University, previously home to Nobel Prize winners Sir Harry Kroto and Sir John Cornforth, and continued closures of Research Council Institutes, the latest announced by the NERC?

By contrast, the University of Central Lancashire (UCLan) has announced that it will re-open its degree course in chemistry, which it closed in 1999, in 2007, as a result of its forensic science graduates realising that they need a chemistry qualification before proceeding to work in forensic science as a career.

Dr Brian Iddon MP
Chairman, Editorial Board
Science in Parliament

Contents

Whit 2006 Volume 63 Number 2

ISSN 0263-6271

The Clean Air Sector Laboratory (CASLAB) is used to study snow and air chemistry and is located nearly two km from the main platform at the British Antarctic Survey Halley Station on the Brunt Ice Shelf in British Antarctic Territory. The data are fundamental to understanding the history of the changes in atmospheric gases over the past millennium. Photographer: Chris Gilbert

OPINION

Baroness Sharp of Guildford

Coming into the House in 1998 from an academic career at SPRU (the Science Policy Research Unit at the University of Sussex), and especially joining its Select Committee on Science and Technology, was a bit like poacher turned game-keeper. I had come on a number of occasions with colleagues from SPRU to give evidence to the Committee – and a pretty tough experience it was too – and now it was my turn to do some of the grilling.

One surprise to me is how well science is served in Parliament in spite of the few members who are trained in science or engineering. The Lords, of course, has the advantage of its cross benchers, quite a number of whom have been raised to the peerage precisely because of their achievements in science and technology. As a result not only does the House support the Select Committee and its sub-committees but there are regular debates and questions on issues of science and technology policy, on subjects ranging from asteroids to the RAE. Indeed, the most riveting and electric debate in which I have participated in the House was the one when we backed the decision to go ahead with stem-cell research, a decision bitterly opposed by the late Baroness Young, who had mustered a considerable army of supporters to vote against the proposal, such that the outcome was quite uncertain.

There are interesting contrasts between the Commons' and Lords' Select Committees. The Commons' committee tends to have shorter enquiries on topical issues; the Lords' to go for the longer enquiry on relevant but not necessarily highly topical questions – for example, in the last three years our enquiries on renewable energy, energy efficiency and water, which, although discrete enquiries, have had a clear link between them. But we have not, like the Commons, been able to drop everything and hold searching enquiries into, for example, the closure of science departments or the crisis in science teaching. (Our recent enquiry on pandemic influenza being perhaps the exception which proves the rule!) The combination of these short, sharp enquiries and the innovation of Westminster Hall debates (and also, it must be said, more MPs with a science or engineering background) means that today, science and technology have a much higher profile in the Commons than, say, ten years ago.

The outsider to Westminster fails, however, to realise how important to Parliamentarians are organisations such as POST – the Parliamentary Office of Science and Technology – whose briefings and seminars on topical issues keep us well informed, the Foundation for Science and Technology with their regular monthly dinner meetings at the Royal Society, and last, but not least, by the Parliamentary and Scientific Committee with its Monday evening meetings and the regular publication of this journal. All provide stimulating debates as well as valuable links with the "real world" of practising scientists and engineers. The specialist all party parliamentary groups should not be dismissed too lightly. They may be annoying in clogging up the post and e-mail systems – surely here is a case for an opt-in option rather than mass circulation – but in their specialist fields they serve the serious function of keeping Parliamentarians abreast of new developments.

Looking back over the last eight years I am struck by two developments. First, what a difference it has made to have a Government which has taken science seriously and recognised the importance of promoting basic science if innovation is to flourish. Of course, there are never "enough" resources, as the present debate on the closure of chemistry at Sussex illustrates so poignantly (although the HEFCE formula for lab-based subjects has much to answer for), and there was an horrific backlog to make good at the end of the 1990s. Nevertheless, it seems to me that science and engineering have benefited from the combination of steady support from the Treasury, the steady hand of just one minister at OST, Lord Sainsbury, and a shared vision of what needs to be achieved.

The second development of note is the shift in attitudes on climate change. Eight years ago there was real scepticism as to whether carbon emissions really mattered and undue complacency at the degree to which Britain's "dash for gas" had provided a painless way to meet our Kyoto targets. No more – David King's message that climate change poses a bigger threat than the war on terror is now accepted – but we yet have to see Government policy matching up to this threat. Perhaps there are lessons to be learned from the SET agenda – steady support, one minister and one vision.

If I have one reservation about current policy it is the old one to beware the seemingly easy "technology fix". If we want creativity, we must not allow too much concentration in university science, and the response to climate change must lie with action from us all, not massive investment from a few.

Baroness Sharp of Guildford sits on the Liberal Democrat benches in the House of Lords and is their spokesman on higher education and science and technology. She is also a member of the House of Lords Select Committee on Science and Technology and is currently chairing its sub-committee enquiry into science and heritage

OPINION

The Budget Highlights Science

Dr Ian Gibson MP

And so it has come to pass that science, technology and engineering have been highlighted for action in the recent budget speech delivered by the Chancellor of the Exchequer. There is at last a real language of science in the document entitled "Science and innovation investment framework 2004-2014: next steps". It emphasises again the need for academics and business to interact but there is an obvious frustration here in that lip service has been paid to it before. Academics are caught in the process of the Research Assessment Exercise which, from reading between the lines, is on its last legs (another victory for the Science and Technology Select Committee 2001-2005). The assessment and the money attached to success must recognise that the Arts play in a different league as far as grants and research are conceived. The time must have come where industry, perhaps through an independent University fund, increases the money available for Scientific Research, without the stigma attached to such research when a project is funded by an individual industry. This may allow more money from taxes to be available for Arts. This could represent real industrial/academic collaboration with peer review still applying, ensuring that industry does not solely dictate research avenues. At the same time joint research projects could be encouraged within a political science strategy.

The document from four Government Departments features heavily on innovation but misses out on explaining the various stages required to progress from lab to social application. It requires ideas, youthful vigour and enthusiasm and encouragement to ensure progress and delivery of results. If our science education process at school encouraged science as a career based on some stability of employment, then we could be ecstatic. If laboratory experimental work was encouraged at school and if it became the major component of school and university training in practical modern laboratories, then our confidence for building science into the national psyche would grow. There are eddy currents in this area but not a tidal wave or even a crusade.

The Chancellor's document neglects mentioning public interaction with the advance of science in Britain, which we want to attain. More Science Cities would galvanise the Science, Technology and Engineering Community, encouraging many different activities and not just academic science. Communities could discuss the science of climate change and temperature increase, and health research from genetics to care. Maybe the Chancellor thinks there are too many branches doing public understanding already and we need to rationalise the process of public participation. I wonder often how much scientists care about this dimension. It may only be a token gesture of the scientific community immersing themselves in an issue, without really seeing the necessity of dialogue.

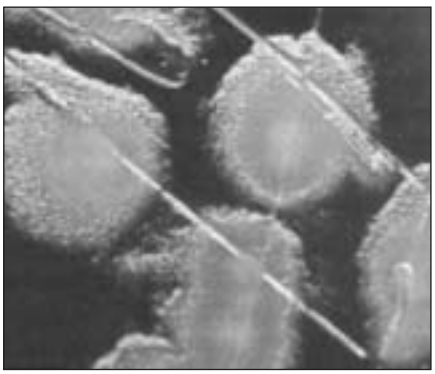
The Chancellor has bravely combined a Research Council and a Department of Health section who both tackle serious issues of health research into a merged financial unit which can concentrate on the delivery of services like clinical trials. There is more yet to be done in the structural organisation of our science base, which I believe will ensure a slicker, sharper workforce with some stable future. I bet the ball is now rolling and more re-structuring will follow. Are scientists in the mood to reorganise themselves? The current think-tank for science, technology and engineering, which I am helping to set up, is going to help in setting a visionary agenda. Whilst groupings in Parliament are mostly reactive to some problem, the need for an organisation to set a national strategy with clear aims is essential. We aim to launch in July and September in separate events.

Science has reached the political radar screen as part of government's mainstream initiatives and will stay there. It has an influence on so many policies and will feature predominantly in promoting an evidence base which guides policy for the future. Short-termism is not suitable for science policy. The Parliamentary and Scientific Committee will play a major role in elaborating science policy over the next months, of that I am sure.

Yet more "Super Bugs"? How can we control them?

Roger Finch, Pamela Hunter, Richard Wise

The spread of bacteria with resistance to current antibacterials is a major concern. The phrase MRSA has been accepted now as common parlance even though few know that it stands for "Meticillin (methicillin) resistant *Staphylococcus aureus*". The general public now consider MRSA to be synonymous with "superbug" and they are aware that infections caused by MRSA are difficult to treat, are resistant to many antimicrobials and that some people catch such infections in hospital.



MRSA

In recent months there have been more frightening headlines referring to the latest "superbug", *Clostridium difficile*, which has caused outbreaks in hospitals, leading to death in some cases. Many of those in the healthcare industry believe that this latest outbreak of a novel strain of bacteria may represent the tip of the iceberg and that we will see increasing numbers of resistant organisms which will be difficult to treat. Why is this and can anything be done?

Anti-infective chemotherapy is quite unlike all other areas of medicine since the agents are not designed to affect a target in the host, as with diabetes, for example, but to attack an "alien", the microbe, which has invaded the host. Microbes will develop resistance to virtually any drug, eventually, even when those drugs are used in a "prudent" fashion. Although new drugs may slow up the increase and spread of resistance, they cannot avoid resistance entirely. Unfortunately, although they are needed, few new drugs are being developed to treat infectious diseases. Why is this and what can be done about it?

Lack of funding is part of the problem

An EU Intergovernmental Conference was held in Birmingham in December 2005 to discuss the situation and to suggest ways of encouraging innovative research. Major pharmaceutical companies who have been the traditional source of new drugs are now reluctant to invest in this area since it is not seen as financially viable. A major reason for this is that if you have an infection and require treatment, you will be given a short course of therapy (7 to 10 days). This is in sharp contrast to conditions such as diabetes, heart problems or epilepsy where a patient will be prescribed a drug for years or even for life. Nevertheless, to get an anti-infective drug to the market place, it will have had to clear the same hurdles as all other drugs. In addition, to reduce the chance of resistance developing, doctors are urged to use antibiotics only when absolutely necessary; this reduces the sales of the drug.

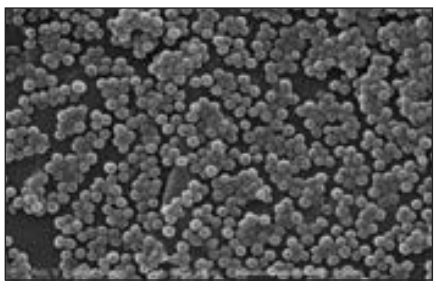
Small is Good!

Small biotechnology companies are more innovative than the large companies and are thus seen as the way forward, but while they can often get "start-up" money, they have a problem in progressing a possible lead to the stage where a large company may be prepared to invest. The in-between stage is both more expensive and carries a higher risk, which discourages potential investors.

A parallel approach, which could improve and extend the use of existing drugs, is to develop more and better diagnostic tests. Currently, initial treatment both in the GP's surgery and in hospital is often based on symptoms alone as laboratory tests can take days to confirm what the infection is, whether the organism is susceptible to standard therapy and thus what the most appropriate treatment is. Biotechnology companies can develop suitable tests that are rapid, accurate and cost effective, and thus could reduce the current uncertainty as to whether antimicrobial treatment is required and what it should be. Funding for such work is again a problem.

Where is the Leadership?

The complex EU market means that most decisions are made at National level, with no overall strategy for controlling resistance and infection. In addition, the preventative measures taken, for example, in hospitals, vary widely. Unfortunately, **infection control costs money** and without the commitment to spend money where it is needed, we may see resistance to antimicrobial drugs spin out of control. Such commitment cannot just be the responsibility of any one nation, but needs to be throughout the EU for it to have any impact. This is a cross-cutting issue that involves health, enterprise and research – there lies the difficulty and the challenge.



MRSA colonies

Counterfeiting of Medicines

John Ferguson
Commercial Affairs Manager, Association of the British Pharmaceutical Industry

Introduction

When Mrs X took her usual dose of Lipitor for Hypercholesterolemia she could hardly have anticipated that she would suddenly and unexpectedly collapse. She had been taking the medicine for some time and had not experienced any side effects. Unfortunately, she is one of the few people each year who receive a counterfeit medicine instead of her real medication and it could have had a disastrous effect because her Lipitor medicine was designed to lower her cholesterol levels and without it she could die from a heart attack or stroke.

The quandary of counterfeit medicines has emerged as a serious and potentially damaging issue for patients, the pharmaceutical industry and the NHS. It is likely that the problem of counterfeits in the supply chain runs far deeper and is more insidious than we anticipate. The discovery of fake Cialis in the supply chain demonstrated that counterfeit products can go undetected for some time and often discovery is a case of luck rather than detection.

The World Health Organisation (WHO) estimates that up to 10% of medicines worldwide may be counterfeit, at a value of about $2 billon annually. Estimates for 3rd world and emerging economies are higher at around 40%. Applying the WHO statistics to the UK it would equate to 82 million packs of medicines that are not genuine. This is clearly not the case. Inspections by the MHRA indicate that the incidence in the UK is a lot lower.

However based on a very small percentage of 0.1% that still amounts to 825,000 packs a year and rising. The main targets of the counterfeiters are the high value products and we have seen several examples over the last few years.

Taking the top 50 UK products and their relative UK sales at an average price of £50 per package, the counterfeiters are defrauding the NHS and taxpayer of £42.5million per annum[1].

Counterfeit (or illegal trade) in medicines may fall into a variety of categories:

- Copies which mimic the original so they appear to be the genuine product, they may or may not contain some of the original active ingredients.
- Substitution or dilution of the original product to increase the quantity in the original batch by addition of bulk such as chalk or other material.
- Illegal imports, either from a non-approved supplier or manufacturer or where the active ingredient has not been approved for use.
- Illegally relabelled products: this is often done to extend the shelf life of short-dated products or to re-label the product with a label indicating a higher strength so the trader can charge more.
- Diverted product includes: product supplied overseas (at reduced cost) under special schemes. Diverted products do not reach intended patients but are diverted to a market commanding a higher price. In the same category is stolen product which is original but the title is not owned by the trader.

Each year the Medicine and Healthcare Regulatory Agency (MHRA) investigates about 100 incidences of counterfeit medicine in the UK.

Why is counterfeiting a problem?

It is a particularly serious crime because it:

- Compromises patient treatment and could endanger life
- Reduces confidence of the medical profession in the quality, safety and efficacy of the medicines they prescribe
- Reduces public confidence in the entire health system
- Defrauds the tax payer
- Damages the pharmaceutical industry's ability to invest in future new medicines

There is a significant health risk to patients from counterfeit products. Counterfeit medicines often contain harmful ingredients, a different active compound or no active ingredient at all. They may also contain insufficient active compound than is required for therapeutic effect so the patient thinks they are being treated, whereas they may not experience any therapeutic benefit at all. Where they do contain active ingredient, the products will not be made to the same quality standards. Injectable products will probably not be sterile and may even be contaminated with human material, particularly where used vials are fraudulently recycled.

In a recent TV programme, children in Africa that were supposed to be injected with adrenalin to treat allergic reactions literally died in front of the camera because the adrenalin had been substituted with water.

Insecure Supply Chain

Pharmaceutical companies manufacture and package their products to extremely high and exacting standards which are regulated by the government through the MHRA. The regulations control everything from purity of ingredients through to the labelling of each carton or container. Even

[1] Source, IMS Data

missing a full stop on a pack can be reason enough for the MHRA to issue a product recall. Once the product has been manufactured, it only has a limited shelf life and the clock starts ticking immediately it leaves the production facility. The product enters the supply chain directly it leaves the factory and at that point the manufacturer loses control of the product as it is then passed through a variety of wholesalers, dealers and pharmacists before it reaches the patient. It is during this process that counterfeit product can be introduced.

Parallel Trade
What is it?

Parallel-trading; the practice of buying medicines in one country for distribution in another country where the price of that particular medicine is higher, emerged as a result of the regulation of the EU pharmaceutical market, whereby member states dictate the price of the medicines they purchase.

The way in which pharmaceutical prices are regulated by each country across Europe leads to price differences in each EU country. These price differences allow traders to capitalise on the free movement of goods around Europe to buy medicines in a low priced country and sell the products to a higher priced country. This activity is perfectly legitimate. However this trade adds no value to the product or indeed the payer (usually the nation's health service) and in reality only really benefits the traders. A recent study by the London School of Economics concluded that parallel trade activity had no significant benefit to the health providers or patients[2].

Why is it a problem?

The manufacturing and distribution of pharmaceutical products is a highly regulated activity. It is strictly regulated in order to protect patients from any harm that might arise as a result of poor practices such as incomplete research, contamination of product, wrong information such as dosage or other problems that may lead to iatrogenic disease (illness caused by medical intervention). The controls also include the way in which medicines are packaged and labelled and certainly include the storage of medicines so that they are kept at the optimum temperature. In this way doctors, pharmacists and patients can be assured that the medicines reach the patient in the optimum condition to treat the patients' illness.

All of these rules apply to parallel traders. However, medicines that are traded in this way can be repackaged and there are insufficient resources to inspect and oversee all these operations. This means that the original product is removed from the manufacturer's packing that contained all the anti-counterfeiting measures as well as tamper-evident seals and put into another carton. This situation may lead to counterfeit medicines entering the supply chain.

Once the patient receives their medicine from the pharmacist, they are confronted with unfamiliar packaging and patient information leaflets often leading to confusion, especially in the elderly.

Finally there is the economic impact. Manufacturers invest heavily in research and development facilities and manufacturing plants in order to be able to supply the best possible medicine for now and the future. Parallel trading takes value out of the system and puts it into the hands of the distributors whilst giving nothing back to the system. In the UK the Government assumes that pharmacists dispense parallel traded product and charges them a fee called clawback to take account of this trade and this actually encourages pharmacists to purchase parallel product because if they don't they will be financially penalised.

Internet Pharmacies

These are often used as a front to sell counterfeit medicines and a quick trawl of Google will generate many millions of hits. Drilling down to the websites quickly demonstrates that the legitimacy of these sites is at best dubious. Statistics show that internet and health spam is fifth in the SPAM e-mail league[3]. A Google search returns millions of hits for these internet pharmacies and the vast majority are not legitimate.

Counteracting Counterfeit Medicines

Over the last year the UK has experienced several instances of counterfeit medicine reaching the patients. In all cases the product has passed through many hands including several short line wholesalers and across international borders before finally reaching the UK supply chain.

There is no single answer to preventing counterfeits and prevention must take a number of forms. Currently industry and government are addressing the situation with a range of measures:

- The prime attack on counterfeiters comes from the Government's regulatory authority, (Medicines and Healthcare Products Regulatory Agency [MHRA]) who police the supply chain infrastructure through their intelligence unit.
- The pharmaceutical industry is working with members of the supply chain and other stakeholders to tighten security in the supply chain.
- The pharmaceutical industry uses tamper evident seals and other packaging technologies to prevent copying in order to deter fraudsters and aid detection.
- The ABPI is working with the European Federation of Pharmaceutical Industry Associations to gain a Europe wide mechanism for combating counterfeiting.
- The pharmaceutical industry is co-operating with the Government's regulatory authority, (Medicines and Healthcare Products Regulatory Agency [MHRA]) as well as Department of Health, Royal Pharmaceutical

[2] The Economic Impact of Pharmaceutical Parallel Trade, a stakeholder analysis, LSE

[3] http://spam-filter-review.toptenreviews.com/spam-statistics.html

Society of Great Britain, HM Customs and Trading Standards to develop and implement preventative measure such as inspection.

- The MHRA conducts field investigations to identify counterfeits that have entered the supply chain.
- Encouraging original pack dispensing so that substitution is made more difficult.
- The UK industry through the ABPI and EU industry through EFPIA are assessing additional methods of identifying products uniquely so that they can be readily identified as genuine packs at the point of dispensing.

New Initiatives

These measures go some way to addressing the problem, but new initiatives need to be added to these:

Primary initiatives: Securing the Supply Chain

The introduction of a more secure supply chain by creating a **product pedigree** in much the same way as was done in the BSE crisis so that all parties in the chain know where the product originated and its status.

The creation of a unique method of **identifying** each pack with a fingerprint using technologies such as Laser Surface Authentication to provide each pack with its own identity so that product can be validated at the point of dispensing. This will require a database of all products which can hold batch number, expiry date and other critical information to enable track and trace. It is critical that the dispensing community take responsibility to have (and use) the scanning equipment to carry out the validation.

Legislation to prevent illegal internet pharmacies from advertising and selling products to patients. Provision of accreditation for legitimate internet pharmacies by the MHRA with a logo of accreditation which can be verified against a database held by the MHRA.

Legislation to introduce a specific crime of making and selling counterfeit and/or illegal medicines within the UK with penalties of up to 10+ years imprisonment and unlimited fines. (Current legislation under the Medicines Act, the standard way to prosecute such offenders, holds a maximum of 2 years in jail and or an unlimited fine)[4].

Secondary Initiatives

Set up a **training initiative** (through the NHS) to provide a training and education programme for all stakeholders to understand the problem and take necessary action to identify fake product. This includes patients, medical staff, pharmacists and even customs officers so that fake product is identified before it is taken by the patient.

Provision of more resources to **increase the inspection** on repackaging and handling of medicinal products so that all people who deal with medicines are working to the same standards.

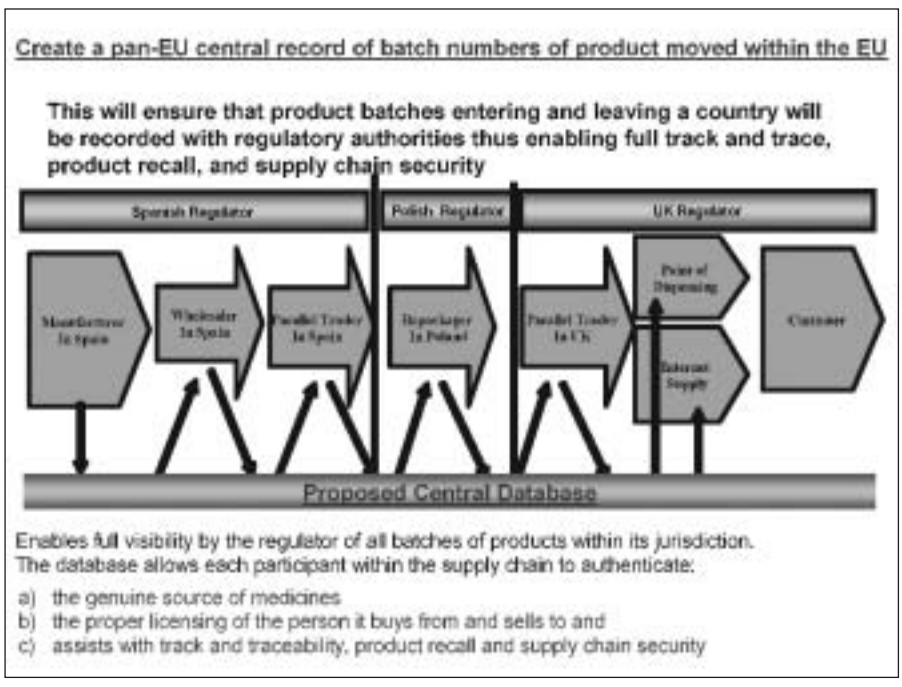
A 6 month study to examine all the tablets being taken by anyone who dies from whatever cause to test if they are genuine and provide statistical feedback on the penetration of counterfeits.

Conclusion

Experts consider that the UK could be a big target for organised crime syndicates who believe that the trade is profitable and low risk. The prime target for counterfeit medicines is the so-called lifestyle products as these products have high individual pack value and high sales volumes. However, counterfeiters are perfectly happy to target any product that will produce a good return on their investment.

Manufacturers include overt and covert techniques to help make copying more difficult and thus prevent this trade. Whilst these physical methods are helpful, combating the trade requires an holistic approach that includes securing the supply chain, inspection of products, physically identifying products with holograms, batch numbers, expiry dates and coding and legislation to prevent traders from repacking medicinal products and eliminate online pharmacies. Legislation is also needed to punish perpetrators and act as a deterrent.

If all stakeholders work together to eliminate counterfeit medicines, Mrs X and thousands of other patients will be able to take their medicines in the full confidence that they are safe.



[4] MHRA Website, press release 30th November 2005 (Global counterfeiting organisation in court)

Building Capacity for Ecology Fund

Professor Sir John Lawton (President), Professor Alastair Fitter (Past-President) and Nick Dusic (Science Policy Manager) – British Ecological Society

In the UK, we can take the existence of scientific societies for granted. Many have long and established histories of promoting their particular science. The British Ecological Society (BES) has been supporting the ecological research community since 1913. However, many countries around the world lack strong scientific societies, particularly in ecology. The BES has created the Building Capacity for Ecology Fund to try to change this situation in Eastern Europe and Africa.

BCEF

The Building Capacity for Ecology Fund is an exciting new initiative that will provide financial support to fledgling ecological societies or help to develop new ones in Eastern Europe and Africa. The Society has committed £500,000 over the next five years to the Fund. Through the Fund, the BES will provide financial assistance directly to the scientists to develop networks of ecologists to promote ecology in their country or region. The BES has also offered to provide advice to ecologists on how to organise an ecological society, if they feel it is needed.

The Fund was created in response to requests from ecologists in Eastern Europe and Africa for this kind of support. Through the success of the Society's publishing activities, it has built up sufficient financial reserves to be able to develop this initiative, which will help deliver the BES's aim of promoting ecology worldwide.

In countries where ecologists have already created an organisation to represent them, but they lack the resources to operate it effectively, the Fund will help those societies strengthen their organisations. This could include financial assistance for them to buy office equipment, construct and maintain a website, organise meetings and hire administrative support. For countries where there is no existing organisation, ecologists could apply for funds to support meetings that would allow ecologists to interact and begin to build the network that will allow a new society to evolve.

Africa and Eastern Europe

In an ideal world, we would like to foster ecological societies wherever there is a need, but we have decided to concentrate our efforts in two significant regions where we believe we can have maximum impact. Recent political events have highlighted the need for a stronger ecological science base in both Africa and Eastern Europe.

The UK's presidency of the G8, the Commission for Africa and the Millennium Ecosystem Assessment all highlighted the need for stronger ecological science and active involvement of scientists in Africa to help foster sustainable development in the region. Ecology is needed to help meet many of the challenges facing Africa, such as food security and adapting to climate change.

The accession of new member states to the European Union has meant that those countries will face both opportunities and threats to their environment. Ecological science is greatly needed to inform the transformation of agricultural practices and implement new legislation. The BES is working with other European ecological societies to strengthen the European Ecological Federation, so that ecological knowledge can be better disseminated across Europe and support the new societies that the Fund will help develop.

Importance of scientific societies

The Fund will support the emergence of thriving networks of ecologists, and eventually the formation of new ecological societies that can promote education and research in ecology, much as the BES has done in the UK. We do not believe that ecology would have developed so successfully in the UK without the BES.

Ecological societies, as well as other scientific societies, provide the network within which scientists can interact, exchange ideas and influence each other. Ecological societies also promote the science and its application among policymakers, natural resource managers and the public. The lack of activities that a society can provide is a major obstacle for the development and practice of ecology in many regions.

The emergence of ecological societies in Africa and Eastern Europe will be a great boost for the science in those regions, a boost that is very timely and important due to the many environmental issues that scientists need to address in those regions. In the near future, the BES's Building Capacity for Ecology Fund will have helped ecologists create more ecological societies that will help us ensure ecology is a vibrant science throughout the world that is able to help society develop sustainably.

Further information www.BritishEcologicalSociety.org/grants/bcef

City Learning Centres

Ann Connor
Education Adviser Department for Education and Skills

How many times have you met a Russian cosmonaut at school and journeyed with him on his flight into space; blasting off from Baikonur Cosmodrome, orbiting the earth and then re-entering the atmosphere for touch down? Or, did you ever climb aboard an erythrocyte as it made its way through the arteries and veins of the human body? These meetings and journeys in science classrooms are a reality for children, particularly if they are able to access a City Learning Centre (CLC).

The Government announced its Excellence in Cities (EiC) policy two years into its first term. This radical step provides revenue for schools in disadvantaged major cities, thus improving performance and engagement. Emphasis has switched from the quality of teaching to the quality of student learning, with the learner becoming paramount, and the City Learning Centre as one of the EiC deliverables. Groups of schools in disadvantaged and often underperforming communities work together to build co-owned, high technology learning centres. The understanding is that the funding has to be used by staff and students to enhance learning and teaching across the whole curriculum, providing Information and Communications Technology (ICT) to the wider community and improving access to the latest technology, to test bed innovation and new ways of working in an environment, which is quite unlike a school. The development of the CLC varies between localities. Some have built new extensions to a central school hub to house the state of the art technologies. Others refurbished old buildings or built a completely separate resource under the guidance of a management board, distinctive from the governance of school in which it was placed.

CLCs give youngsters "hands-on" experience with resources normally beyond the scope of the school budget and provide learning that exceeds the confines of the school day or year by sharing good practice and innovation. The first CLC opened in 2000 and today there are 105 centres operating in 57 local authorities. So how far have they come and what impact are they having on science education in the UK?

Science learning is challenging for many young people, requiring a wide range of abilities in a young scientist: logic, enquiry, analysis, persistence and exploration. Under 10% of schools are designated as specialist science colleges, 70% of students reach national standard at KS3, GCSE chemistry, physics and biology have recently been named as difficult GSCEs and uptake at A level has declined and so there is much work to be done.

Innovation in learning is being delivered through a variety of projects at CLCs and is now embedded in schools' curricular programmes. Many centres experiment with cutting edge technology using a range of devices and software from robotics, control and data logging, leading to digital media, computer aided design and manufacture, interactive Q&A sessions using mobile-phone-like texting, virtual reality and bluescreen technology. Innovation is providing opportunities to develop and test new approaches which have a positive impact on understanding in science and improving student attitude to learning and enjoyment as pupils are "hooked-in".

The CLCs have piloted video-conferencing, extending links and providing access to specialists and creating discussion with their peers, that would previously not have been possible. Blackpool CLC is working with America whilst Nottingham links with Lithuania. Some Centres include video-conference links as part of the curriculum. Students at Frankley CLC, Birmingham, study Forensic Science with a Forensic Archaeologist from London and the local police, using the CLC resources to undertake forensic tests. Other students have piloted the new video-conferencing e-Mission with the National Space Centre in which astronauts become stranded on Europa, an ice moon of Jupiter. Pupils monitor their life support and health, look into ice tremors and plan recovery routes. CLCs bring many expert professionals into the school system,

Young TV editors engrossed in making their Science Programme at Huyton CLC

who although not trained teachers, give students the opportunity to work with expert adults. Primary students spent an action-packed day at Parklands CLC, Liverpool as part of a science secondary transition project investigating city criminology in the context of the Murder at Honey Lane High. They worked with the City Historian, police, journalists and teachers to take forward their evidence from DNA finger printing.

Many CLCs have invested in digital media technologies, offering a range of hardware and software that match or surpass industry standards, allowing schools to explore new approaches to assignments that increase levels of challenge, interest and enjoyment. Stockton CLC took students to Robin Hood Bay where they snorkeled with digital cameras and videos to record marine life. The tidal cycle was time-lapse recorded to demonstrate ecological and astronomical phenomena. At Longbenton CLC students use bluescreen technology to drop inside a cell to explore its structure and function. 3D stereo projection allows them to enter a human heart with scientists from Teesside University, and to follow the journey of an erythrocyte around the circulatory system. Like other centres, this one links to the National Space Centre for e-Missions. Volcanic eruption is the problem requiring solution for students working as scientists and environmentalists processing and handling data accurately. Year 5 used digital animation to investigate animal adaptation and habitat and Year 13 students benefited from the lecture series offered as masterclasses by staff from Jesus College, Cambridge.

Several schools make use of the Virtual Learning Environment to research the Solar System with Open University scientists. Children are linked up "live" to interrogate experts. Children were linked to a conference in Texas and spoke directly to Dr Tim McCoy, at the Smithsonian Institute, Washington. Anyone can now visit the CLC website to hear the webcast of this interaction (www.vle.stocktonclc.co.uk). Who can fail to be inspired when hearing the eager, searching questions of the young scientists? – How do space craft go into orbit around other planets? – What colour is Saturn`s core? – followed by the laconic, knowledgeable transatlantic response. Alternatively, the podcast of the event can be downloaded. The work will soon be uploaded on the OUs RSF site from which the resource will be available for any teacher or pupil to use worldwide.

Digital media have also enhanced ecological studies such as those undertaken by 8 year olds in Sunderland where data loggers, digital microscopes and cameras enable children to test variables such as temperature and light that impact on crustacean habitats.

Many CLCs provide curriculum developers in substantial training programmes designed for teachers. Towneley CLC, Lancashire organises Heads of Science collaboration with classes on improving performance for course work examination. Students are also involved in Science Roadshows using robotics, media and science game technologies. Visits to the Sheffield CLC by groups of Chinese teachers resulted in the launch of the eChina project, and with film and examples of British curriculum materials being sent to the Beijing Institute of Technology, for inclusion in their teacher training programme.

High quality Computer Aided Design and manufacturers' facilities exceed the experience and budget of most schools, yet some CLCs' standards match those of industry. Design software linked to computer controlled laser cutters, milling machines, lathes, sewing machines and the latest 3-D printers provide opportunities in schools to raise A level Technology grades. Frankley CLC works with local business to solve industrial problems and student awareness of commercial interests improves their understanding of economic developments. Many primary schools are unable to deliver the control technology element of KS2 due to limited resources or expertise, unless they use CLCs that are properly equipped and have staff to provide a high quality experience and train teachers along with their students.

Many CLCs work closely with talented students offering valuable e-learning opportunities through masterclasses and Summer/Easter schools with access to specialised equipment. In Hammersmith, pupils designed an informative HIV/Aids website. In Hackney, primary children researched and organised scientific investigations into forces to create an online video quiz which is now used by other pupils and teachers. In Wirral, primary work has led to an Astronomy Club and improved links to the National Schools Observatory. Sports Scientists at South Camden view and analyse video clips of their own performance, capture skills, compare contact, break down activities and improve learning. They work alongside younger, secondary scientists on a "Cars in Motion" project in which teams evaluate a Grand Prix circuit, devise a race strategy, calculate safe speeds appropriate to the changing track, use practice laps and make improvements to performances. Able younger children investigate healthy eating and create a TV report using their own research, scripts, recordings, transitions, editing and presentational skills. Centres cater for learners of all needs and abilities, none more so that in North Hull where autistic children access the science curriculum independently through the use of technology.

Community members access courses including "silver surfers clubs" for the retired. Centres nationally average over 100 adult learners per week, many of which successfully complete accreditation on courses. Blackpool CLC has over 1000 adult members and around 110 use its TV studio each month for a variety of projects. Infants have learnt alongside adult family members at Sheffield CLC to increase involvement in family learning.

The newly opened National Science Learning Centres will provide further links for the CLCs such as those developing at Redcar & Cleveland. They will provide the highest quality professional development for science teachers and technicians, to drive standards and enjoyment of scientific learning in our schools even higher.

Antarctica – A Continent for Peace and Science

David Walton
British Antarctic Survey

There are only seven continents and most of them have been wracked by war, border disputes, environmental damage and other difficulties to which the human condition is prone. How refreshing and different then to celebrate a continent where national claims have been set aside, where environmental controls are second to none and where peace and science are the objectives for all of the countries involved. Antarctica is indeed a special place on this overcrowded Earth, providing us with the baselines against which we can measure not only our continuing pollution of the world but also how realistically we can work together for the common good. The Antarctic Treaty, signed in 1959 and ratified in 1961, is the legal instrument upon which the management of this continent rests and it has shown itself to be one of the best and most lasting examples of international co-operation for the general good.

Each year the Treaty Parties meet in a host country, moving alphabetically through the 28 members that constitute the Consultative Parties – those with an active and continuing presence in the Antarctic. These Consultative Parties comprise a very wide range of cultures, languages and governance and together with the 17 Acceding Parties account for around 80% of the global population. Although not representative in terms of the 192 member countries of the United Nations the Parties are clearly representative in terms of the world's population with virtually all of the most populous countries – for example China, Japan, India, Russia and the USA – as active members. This year the annual meeting is the responsibility of the United Kingdom to organise and host and the Foreign & Commonwealth Office is busy planning for it to take place in Edinburgh in June. The FCO have also decided that it will be an opportunity to provide greater public engagement and with assistance from British Antarctic Survey and the Royal Navy they have laid on a wide range of public events.

The main platform at Halley where staff live and work for up to two years at a time measuring and monitoring changes in the earth's atmosphere. Photo Chris Gilbert.

For those interested in science and policy the Antarctic is a fascinating example of what can be achieved by consensus, despite widely differing national agendas. Over the past 40 years the Parties have grappled with resource management (both biological and geological), pollution, habitat and species damage, the value of historical heritage, the management of and access to scientific data, the development and control of tourism, conservation at the habitat and species levels and the contribution of Antarctic science to our global understanding amongst many other topics. Since it was established the Treaty has taken independent scientific advice from the Scientific Committee on Antarctic Research (SCAR) and more recently has had advice from the Council of Managers of National Antarctic Programmes (COMNAP). In addition there are a host of experts from, for example, the UN Environment Programme, World Meteorological Office, International Hydrographic Organisation, the International Association of Antarctic Tour Operators etc who attend the annual meetings to give specialist advice.

What will the Treaty Parties be discussing this time round? There are several developing topics, some of which have been under extended discussion for years. Top of the list this year is certain to be the International Polar Year (IPY) which begins on 1 March 2007. The Treaty Meeting will devote a whole day to discussing how the planning for this focus on the polar regions by over 40 countries is progressing, what we will learn from it and what sort of legacy it will leave for future generations. The last IPY in 1956/57 not only marked the first crossing of Antarctica (led by the UK) but also provided the impetus for the negotiation of the Antarctic Treaty itself.

A second major topic will be management of tourism in the Antarctic. With numbers growing year on year and with concerns over long-term environmental damage the Parties have been searching for a way to agree on the usage of particular sites, in collaboration with IAATO. Whilst as yet there is little unequivocal scientific evidence of

irreparable damage, human impacts can be observed in the Antarctic Peninsula sites, including the erosion of footpaths. Common sense indicates that such impacts are only likely to intensify unless the numbers of visitors to some sites are controlled. Last year the Treaty adopted the UK-proposed concept of Site Guidelines, which are essentially mini-management plans and this year the Parties will be looking at such proposals for eleven sites on the Antarctic Peninsula.

Another topic of continuing interest is the investigation of the subglacial lakes that lie under the ice sheet. Over 140 have now been identified. The largest of these, Lake Vostok, may well have been sealed off from the atmosphere for over half a million years and nobody knows what might be found in the water and the sediment. However, sampling these without contaminating the lake is technically very difficult and several countries have been working on the right equipment to do this. Russia expects to take the first samples during IPY and the latest reports on progress towards this are likely to excite considerable discussion.

Having agreed at the last meeting in Stockholm on a new legal instrument establishing the principle of liability for environmental damage the Consultative Parties now need to develop this into a usable process. Agreement on definitions for damage have been difficult to achieve but so has agreement on what is adequate repair and remediation, when and if this is possible.

Whilst the Treaty has developed a range of conservation measures for the area south of 60ºS these need to be better connected with conservation practices in the rest of the world. The birds and animals do not of course respect the arbitrary lines we draw on maps and migratory or wide-ranging species find themselves subject to differing treatments inside and outside the Antarctic. For those species under threat this is clearly not helpful and the Edinburgh meeting will be considering which of these species need to be afforded special protection within the Treaty area and for which Parties need to agree specific management responsibilities. In addition there is a growing interest in designating Marine Protected Areas in the Southern Ocean to protect both areas of high marine biodiversity and those locations where large numbers of birds and whales go to feed. The responsibility for progressing this is under discussion between the Antarctic Treaty Parties and the Commission for the Conservation of Antarctic Marine Living Resources to ensure that the Antarctic and its surrounding sea is managed sustainably for the public good.

In an age when anthropogenically enhanced climate change is a concern of almost all governments, monitoring the health of the Earth from the polar regions has never been more important. The scientific data obtained from Antarctica is proving crucial to our attempts to model and predict the future state of the world. Antarctic ice cores now provide data on the last one million years of climatic cycles, whilst measuring the changing balance of snowfall and ice loss is critical to understanding changes in world sea level. The levels of pollutants in the snow provide the baseline against which to measure changes in the rest of the world, whilst the South Pole measurements of greenhouse gas concentrations show clearly the ever upward trend from human activities. There is now a growing interest in the biotechnology potential of the cold adapted species that live in these ice infested waters, and the fisheries around the Southern Ocean provide an example of how to manage such a resources on a scientific and sustainable basis. Antarctic science really does make a difference.

The UK has been continuously active in the Antarctic since 1944 and a major player in the drafting and implementation of the Antarctic Treaty. Its success in setting the agenda and ensuring good governance has been due to the continuity of experience in Antarctic affairs provided by the Polar Regions Unit at FCO. With only three leaders over 50 years this Unit has unrivalled experience in this international forum, ensuring that the UK has always exerted influence much greater than its resource investment would justify, often enabling it to set the agenda.

As more countries accede to the Treaty the importance increases of co-ordinating the research undertaken whilst minimising the environmental impacts . Sharing both the costs of undertaking the studies and the results of research has been a feature of the Treaty from the start. With its research on global problems for the common good and its consensus international government the Antarctic is indeed an example of how nation states can work together despite their cultural and political differences.

Antarctic Treaty Consultative Parties and Acceding Parties

Consultative Parties			
Argentina	Ecuador	Korea, Republic of	South Africa
Australia	Finland	Netherlands	Spain
Belgium	France	New Zealand	Sweden
Brazil	Germany	Norway	Ukraine
Bulgaria	India	Peru	United Kingdom
Chile	Italy	Poland	United States of America
China	Japan	Russia	Uruguay
Acceding Parties			
Austria	Denmark	Korea, Democratic People's Republic of	Turkey
Canada	Estonia	Papua New Guinea	Venezuela
Colombia	Greece	Romania	
Cuba	Guatemala	Slovak Republic	
Czech Republic	Hungary	Switzerland	

CCLRC Knowledge Transfer - Creating the Environment for Science and Innovation

The Council for the Central Laboratory of the Research Councils (CCLRC) is one of Europe's largest multidisciplinary research organisations operating the Rutherford Appleton Laboratory in Oxfordshire, the Daresbury Laboratory in Cheshire and the Chilbolton Observatory in Hampshire. The CCLRC manages fundamental research facilities in neutron scattering, high power lasers and synchrotron radiation alongside broad science and technology programmes ranging from space science and high performance computing to particle physics and advanced instrumentation. These facilities and programmes are operated on behalf of the UK's academic community and fellow Research Councils.

Given this remit, we are renowned for supporting and conducting excellent scientific and engineering research. Perhaps less well-known is our commitment to transferring the knowledge generated from our research programmes and facilities to the wider economy. This will enable economic growth in the UK and allow us to meet the challenges set out in the 10-Year Science and Innovation Investment Framework.

We have ambitious and exciting plans for our future Knowledge Transfer (KT) programme. The organisation will continue to build on the successful exploitation of intellectual property through CLIK Ltd, a wholly owned subsidiary of the CCLRC, through spin-outs, licensing and trading. We will also focus on closer engagement with industry through promoting wider usage of our large facilities by industry and other PSREs. This will require specialist marketing of our capabilities in appropriate market sectors. A dedicated team of sector-based marketing professionals is being recruited to take forward this initiative.

The CCLRC is responsible for access to, and development of, the UK's sources for neutrons, synchrotron radiation and high power lasers – all of which offer unique opportunities for materials characterisation and imaging. Data interpretation and subsequent imaging of experimental results are key aspects which allow industrial users to evaluate product performance and development and hence gain competitive advantage. We are currently developing projects which will offer a data interpretation and analysis service for industrial users in combination with the provision of imaging solutions for industrial applications.

The CCLRC Rutherford Appleton Laboratory which will be the focus of the HSIC. Currently under construction at the site is the Second Target Station at ISIS and the Diamond Light Source.

In addition to wider facility access provision, we intend to establish both an internal and external KT awareness programme. Externally this will promote the organisation's potential and capabilities in the KT arena to key stakeholders. Internally the aim is to engender a culture and environment which will lead to greater exploitation opportunities and a greater spirit of entrepreneurship. In combination, we are developing a significant education and training programme which will enable the flow of highly skilled and specialised people between the CCLRC's facilities, industry and universities.

The plans do not stop here. We recognise that in order to deliver this programme it is essential to create the appropriate environment in which to work and to host high technology programmes and industries. Perhaps the most ambitious and innovative aspect of the CCLRC's KT plan is the creation of multi-partner mixed-economy campuses centred around its two major sites.

Together with university and regional partners, we are establishing a new national concept for the delivery of world leading science, innovation and knowledge transfer. In parallel with the Chancellor's recent Budget statement, the Government has announced that the Daresbury Science and Innovation Campus (DSIC) and the Harwell Science and Innovation Campus (HSIC) will be established at the CCLRC's Daresbury Laboratory in Cheshire and Rutherford Appleton Laboratory in Oxfordshire.

In response to the announcement, the CCLRC Deputy Chief Executive, Professor Colin Whitehouse, who is leading the CCLRC KT programme,

The CCLRC Daresbury Laboratory showing the new Daresbury Innovation Centre and the Cockcroft Centre to the left of the site. The surrounding land has potential for further expansion.

said "I am delighted with the Government's announcement and the distinct opportunity that the CCLRC and its partners now have to make a significant contribution to UK wealth creation. I believe this is a truly unique model within the UK and one which I am certain will be a great success for all involved".

The dual centre model is at the heart of our knowledge transfer plans and builds upon the unique nature of the organisation as a provider of large research facilities, science programmes and associated instrumentation and engineering capabilities. It takes advantage of the complementary activities on both sites and seeks to further strengthen these through co-location of university and industry partners on the sites. Through DSIC and HSIC, we will act as a catalyst for innovation and knowledge transfer.

Establishing the model

In just 18 months, the DSIC has moved from concept to reality and reflects a highly successful partnership between the CCLRC, the North West Development Agency (NWDA), the universities of Lancaster, Liverpool and Manchester, and Halton Borough Council. DSIC aims to attract the cream of high technology companies whose activities will benefit from co-location with the CCLRC and its academic partners. At Daresbury, this "added value" was only possible by the NWDA developing land adjacent to the Daresbury Laboratory.

The first NWDA building opened in April 2005 and there are already 21 new high tech companies based in the Daresbury Innovation Centre. The Centre Manager, Dr Paul Treloar, anticipates that it will be full well ahead of schedule; "We are negotiating with more than 40 small businesses who want to take advantage of the unique facilities that the Innovation Centre and wider campus have to offer. The current tenants have already attracted venture capital funding in excess of £5 million. It's a very stimulating environment to work in!"

The second building, originally intended to provide expansion space for the Innovation Centre businesses, will now house the Cockcroft National Accelerator Science Centre funded by the Particle Physics and Astronomy Research Council, NWDA and CCLRC. The Cockcroft Centre will bring together accelerator scientists from the partner universities and ASTeC, the CCLRC's Centre of Expertise for Accelerator Science and Technology, to create a critical mass of internationally recognised scientists – clearly beneficial to the academic partners, but also a distinct asset to DSIC. The Cockcroft Centre will provide the intellectual focus, educational infrastructure and the essential scientific and technological facilities for accelerator science and technology research and development in the UK.

There is now an urgent need for "grow on" space for the Daresbury Innovation Centre businesses and NWDA is seeking further funding to add two more buildings on the campus. But this is still just the start. The original partners are planning to establish a company which will oversee the expansion of the campus and Professor Colin Whitehouse believes the future is very positive "We have a ten-year vision for the DSIC, with the CCLRC laboratory at the heart of the concept. DSIC will soon be a reality, placing the North West firmly on the international innovation map."

Extending the concept

Ambitious plans also exist for the CCLRC Rutherford Appleton Laboratory, based on the DSIC model, which already enjoys close working relationships with its neighbours who include the Diamond Light Source, the UK Atomic Energy Authority, Medical Research Council and the Health Protection Agency. Early masterplanning and concept designs have been developed which provide incubator space for new businesses, specialist research institutes and conference facilities, surrounded by the CCLRC's existing experimental facilities. With strong backing from the government via its knowledge transfer agenda, it is anticipated that development of the HSIC will commence in the near future.

The CCLRC will be at the centre of each campus, providing the hub through which the partners and tenants at each science park can access the facilities and expertise at the other. This is an exciting prospect to develop a world class model for knowledge transfer, demonstrating better exploitation of public money and making a tangible contribution to the UK economy. We believe that our complete KT programme, including these exciting campus developments, will allow us to provide the step change in our KT programme required to meet the challenge of delivering increased levels of economic growth through innovation.

Further information on the CCLRC's KT activities is available by contacting -
Claire Dougan
KT Manager
Rutherford Appleton Laboratory
01235 445168
c.dougan@cclrc.ac.uk
www.cclrc.ac.uk

MEETING OF THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE ON MONDAY, 23RD JANUARY

Hospitals of the future will revolutionise the way in which hospital care is delivered and hospitals will develop new procedures and processes as some existing ones shift to primary care. New healthcare technologies, including robotic surgery, wearable and implantable monitors exploiting wireless communication and new IT systems will require multi-skilling of staff and purpose-designed buildings which will be funded by the Private Finance Initiative. The roles of general hospitals and the national, often university-linked, hospitals can further differentiate. The latter will often become the points of adoption and development of potentially revolutionary new technologies and systems. The adoption of new technologies will become more solution-based with academia, industry and the NHS working together on aligned objectives

Introduction

Sir Richard Sykes FRS FREng
Rector, Imperial College

Major changes in roles and service delivery within the whole spectrum of healthcare will occur in the future. Hence we really have to consider the primary healthcare and hospital sectors at the same time. We are already feeling the impact of several new technologies such as structural biology, genetics, cell and tissue engineering, hi-tech vaccines, bionics, and it is necessary for us to respond to the rapid pace of scientific and medical innovation. Many of these technologies are highly disruptive and will totally change current concepts of medical intervention. Some of these will entail expensive once-off procedures which improve quality of life and which greatly decrease later dependence on healthcare resources. Current taxation or payment models may not cope with such redistributions of cost within the overall healthcare budget, causing certain disruption.

Multidisciplinary research leads to new capabilities eg mechanical engineering research combined with both computing and medical research has led to much improved forms of robotic surgery with exquisite precision and significantly diminished trauma to patients. If we are to apply such technologies effectively, new skills – often very specialised skills, within our health services, are needed. This may result in the disappearance of old roles which will be replaced by new ones and may even mean that more medical care is delivered by specialist technicians and less by generalist physicians.

Accurate and rapid point-of-care diagnostics could bring great efficiencies to healthcare if widely adopted and coupled to targeted drug therapies. But roles have to change – the primary care physician needs to reassume the role of blood-letting whilst engaging in a different type of conversation with the potential for greater patient involvement whilst the symptoms are extant. Also, the dependence on distant laboratories, often in hospitals, is changed. The availability of such new approaches typifies an aspect of healthcare in the future – the confluence of information from different sources in real time or near real time.

IT systems, responsible for bringing information together, are already having a significant impact. IT will continue to revolutionise healthcare and must be helped to do so. IT will enable data from many different sources to be brought together simply for viewing at a single point. It will also allow for regional or even international boundaries to be crossed in treating mobile individuals or bringing scarce medical expertise to less-developed

or skill-poor environments.

The roles of the primary care and hospital sectors must continue to change if we are to make full use of new potential capabilities. Primary healthcare is now more than a gate-keeper to the wider health environment. It is itself a core provider of services and will continue to grow this role. Increasing adoption of new technologies and access to comprehensive medical record data could increase the role of the primary care sector even further and relieve hospitals of certain types of demand. It is not clear, for example, why most diabetic or asthmatic patients should ever have to call on hospital care.

The number of hospital beds in the UK has decreased dramatically in the last 50 or so years. In 1950, UK hospital beds were 550,000 and in 2003, UK hospital beds were 230,000. This continuing trend is largely due to two factors: the increased potential for health management within the primary sector and the increased productivity of hospital healthcare provision as reflected in the average number of days patients occupy beds as part of their hospital attendance. New surgical techniques with earlier transition to ambulatory care are a key factor here. There is, however, still much room for improvement as inpatient stay in countries such as the USA is around 2 days shorter than in the UK.

Making full use of remote monitoring will also be a key to helping patients with chronic diseases to enjoy good health care without requiring long periods of hospitalisation. At present chronically ill patients account for around 60% of bed spaces and 80% of NHS costs. Another emerging theme is that of preventive medicine – essentially managing people's medical future – which will hopefully also have a major impact on need for hospitalisation. This also will represent an area for significant investment and will again challenge the current compartmentalisation of budgets. However, decreasing demand on beds should make available at least some of the funds needed for re-investment in community care and preventive medicine.

So, hospitals in the future will develop new procedures and processes as some existing ones shift to primary care. And within the Hospital Sector, the roles of general hospitals and the national, often university-linked, hospitals can further differentiate. The latter will often become the points of adoption and development of potentially revolutionary new technologies and systems. The adoption of technologies in the future will become more solution-based with academia, industry and the NHS working together on aligned objectives.

Hospital of the Future

Candace Imison and Professor Sir Ara Darzi
Imperial College and the Strategy Unit, Department of Health

There are many powerful forces for change in our population's health and the way we deliver health care. We were fortunate to be able to draw upon work undertaken by the DH Strategy Unit on future health care trends, details of which are available at http://www.nhsconfed.org/influencing/strengthening_local_services_resource.asp. This section summarises the key findings of the Strategy Unit's work in this area.

The population is ageing. The balance between young and old is shifting. Life expectancy is increasing, as premature mortality rates fall. The average family size of 1.77 (2004) sits below the replacement level of 2.1. The number of single person and single parent households is growing. The number of people over 60 is expected to grow by nearly a third by 2021, while the number of young people under 16 will fall. The ethnic population is also ageing. However, there is significant uncertainty about the net impact of the ageing population on health care demand. The workforce is also changing and ageing. The national and international competition for skilled staff will grow, and the workforce is demanding a better work/life balance.

Current lifestyles present major risks to the future health of the population. Obesity, sedentary lifestyles, sexually transmitted disease, and alcohol consumption are growing, especially amongst the young. This is driving increased incidence in diabetes, osteoarthritis, heart disease and kidney disease. Over a quarter of the population still smoke. This creates a significant burden of respiratory disease and cancer. The disease profile is changing. Previously fatal acute conditions such as cancer and heart disease can now be treated. Ageing related and chronic diseases, such as diabetes, respiratory illness, renal disease and arthritis, are becoming much more significant. More people are living with long term illness, and with multiple conditions.

Health inequalities continue to present a challenge. People from lower socio-economic groups are much more likely to adopt risk taking lifestyles and yet are frequently handicapped in accessing health services and taking on board positive health messages – 40% of those from social classes D&E have poor literacy skills.

Medical advance can improve health outcomes, but will create budgetary pressures. Significant advances in medicine and surgery are anticipated, supported by the increasing insight offered by genetics. The "capacity to treat" is increasing, especially the older frail. This magnifies the potential demand of an ageing population. At the same time, the expectations of society are changing. Rising education and income levels are helping to drive higher public expectations of health and health care services. The future old are expected to be much more demanding than their current counterparts.

Advances in information technologies enable improved models of care. The capacity to share clinical information and expertise between professionals and patients offers many opportunities for patients to take a positive and active role in their care and improve the quality of patient care and outcomes.

There is significant debate about the impact of an ageing population. The incidence of chronic disease grows markedly in those over 60, but there is also evidence that the old of today are fitter than the old twenty years ago, postponing the onset of chronic disease. As chronic conditions are diagnosed earlier, treatment is likely to be more effective. One of the greatest uncertainties is that of the impact of current lifestyles on the population over the next two decades. Will the young of tomorrow have even greater levels of obesity, sexually transmitted disease and drug misuse than the young of today, and will the old be sicker and more dependent? A lot will depend on society's attitude and response to risk-taking behaviours. We have the opportunity to live longer and healthier lives than ever. Will society grasp that opportunity, or will we see health inequalities increase as some do and some don't, or perhaps can't.

These forces bring threats and opportunities to the health of the population and health care services. The impact on health care demand and our capacity to meet that demand is very difficult to foretell, emphasising the vital importance of retaining flexibility in the healthcare workforce and asset base to respond to uncertain future developments. However, the Department of Health's Strategy Unit has attempted to identify the likely impact of demographic change and medical advance on key disease areas; their conclusions are summarised below:

- **Musculoskeletal disorders** - Rising incidence rates due to ageing population and rising obesity. Few currently effective primary or secondary prevention strategies. Increased capacity to treat surgically. Anticipate large growth in demand.
- **Respiratory Disease** - Future demand will be very dependent on capacity to reduce smoking in the population. No major treatment improvements on the horizon. Drug resistant infection could reduce treatment capacity. Demand likely to be sustained.
- **Heart Disease** - Future demand for care is likely to increase as a result of ageing population and rising rates of diabetes and obesity. Secondary prevention measures and new therapies are shifting treatment from inpatient to ambulatory care setting.
- **Cancer** - Future demand for care will grow as the population ages, but demand will vary according to type of cancer. The treatment model is changing from acute to chronic disease management as mortality rates fall. New treatments likely to have significant costs. Demand is likely to grow with significantly growing demands in primary care settings.
- **Diabetes** - Future demand for care will grow significantly unless obesity trends can be reversed. Cell therapy, better monitoring and new pharmacological treatments should reduce mortality and disease complications in the longer term.
- **Kidney Disease** - Future demand for care is expected to rise steeply over the next ten years. The link to age and some ethnic groups will mean that demand patterns will vary significantly across the country. Medical advance holds no immediate prospect of addressing this steeply rising need, but in the longer term should provide means of stopping or delaying disease progression and reducing complications.

The relative impact of these trends will be different over time. It is possible to estimate the time at which particular trends will have the greatest impact, but when reading this it should be borne in mind that predictions of the future are frequently right about the type of change but are often wrong about the pace of change.

0 – 5 Years

In the next five years, the drivers of most significant impact are likely to be the increasing use of IT and the rise of consumerist behaviour in health care. Surgical technology will continue to make more minimally invasive surgery possible. Health care training and careers will be changing and becoming more flexible. Expert patients could increase the amount of self care, but could lead to higher demands and wide access to health information over which there is no quality control could also result in misinformed patients. New cancer treatments become available.

5 – 10 Years

In the next five to ten years, "intelligent technologies" eg automated analyses, medical devices that can self monitor and call upon expert/professional help automatically will play an increasing role in care. Miniaturisation of diagnostic and monitoring tools is likely to be significant, making these available in local or home settings. Professionals could be making much greater use of "intelligent devices" expert systems software to support clinical decision making, for example. There will be increased use of "data mining" and systems that can infer "rules" based on experience of previous events. The use of genetic screening will become widespread and pharmacogenetic drugs will appear.

10 – 15 Years

In ten to fifteen years, the ageing of the workforce and population could create significant service pressures. Chronic disease will be increasing. We could see the (re-)emergence of infectious diseases as a result of global warming and increased population mobility. We might be seeing a mainstream use of some genetic therapies. There might be a major pharmaceutical innovation in one or two disease areas.

15 – 20 Years

In fifteen to twenty years, the pressures on the workforce may mean the idea of retirement might start to change. We could see further medical advance such as use of stem cells to regrow body parts and/or correct/repair injury.

This overview emphasises that there are major threats to health in the future, from rising rates of obesity, alcohol consumption and high levels of smoking. These combined with growing numbers of older people could put significant burdens on services unless current trends are reversed. There are also opportunities to provide better and more effective healthcare, as conditions which were once fatal can now be cured. The capacity to treat is growing, but so are costs.

A sustainable health care system will need to maximise its impact on health down stream, and focus on primary and secondary prevention across the whole life course. Given the rate of change and uncertainty about the future, health care providers will need to be able to constantly adapt their services to this rapidly changing environment. Some commentators have predicted that the next twenty years in medicine will see as much change as the last two hundred.

HOSPITALS OF THE FUTURE

Information Technology in Healthcare

Professor Richard I Kitney OBE, FREng
Department of BioEngineering, Imperial College

Introduction

Clinical Information Systems (CIS)[1] have developed rapidly over the last decade. Much of this development has involved various imaging modalities, coupled to image viewing systems known as Picture Archiving and Communications Systems or PACS[2]. The universal availability of medical information, including images, waveforms etc, will become increasingly important. This paper addresses some of the key issues relating to the development of new technology for medical information in the context of more general clinical information systems. With the increasing importance of molecular and cellular biology, a new type of medicine, molecular based

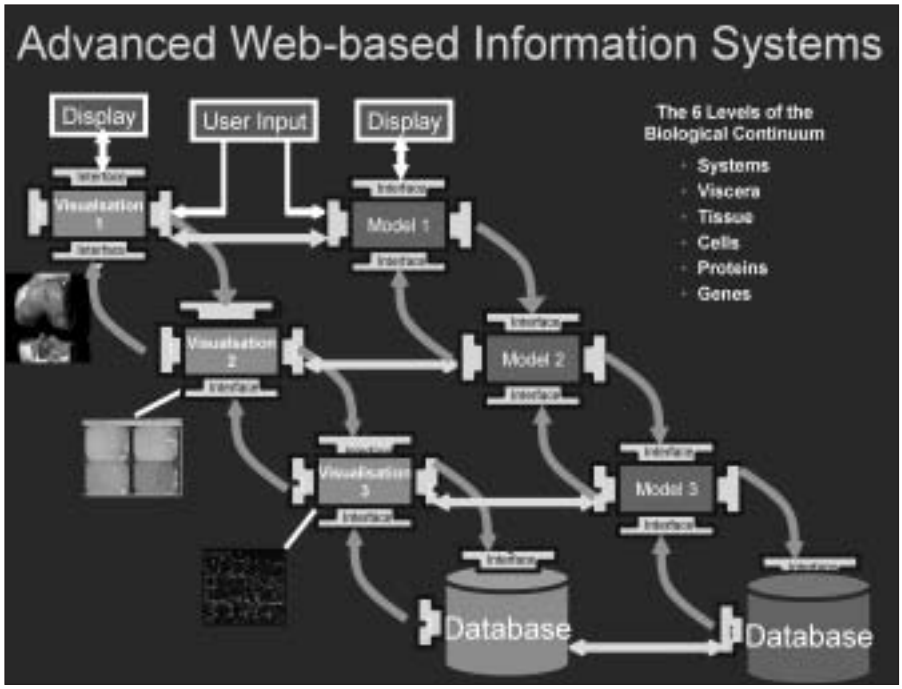


Figure 1. Schema of an Advanced Web-based Clinical Information System

medicine, is now developing. This will significantly alter the way in which medicine is practised. The view that will be presented here is that in future CIS and PACS will need to operate seamlessly across the Biological Continuum[1] ie, the hierarchy of the human organism comprising systems, viscera, tissue, cells, proteins and genes.

The important international clinical trends will lead to a world in which imaging systems and PACS will be used routinely – and directly – across a range of clinical specialties (eg cardiology, oncology, surgery, pathology etc). Image data acquisition already takes place in many of these specialties, but the images are often only viewed on technology associated with the acquisition device. A good example of this is the acquisition and viewing of arthroscopy images (minimal access surgery knee images). In many specialties imaging is currently where Radiology was in the 1980's, ie viewing on individual machines. This situation will significantly alter in the near future largely, both directly and indirectly, through changes in technology. These changes will allow universal access to data, images, waveforms etc across the Enterprise (eg the hospital) and beyond.

Four key components which make the universal image and data access achievable are:

- The price and power of computers – for example, Pentium computers have the processing power of the Unix workstations previously used for CIS and PACS at a fraction of the price
- The availability, use and price of industry standard hardware. This moves CIS and PACS from being based on specialist hardware and operating systems to standard hardware and operating systems – with all the associated cost savings which can be achieved through economies of scale.
- The presence of a comprehensive international standard for imaging (DICOM), together with other standards (eg HL7 and XML).
- The ability to provide fully web-based (ie Internet Protocol based) clinical information systems (CIS), including PACS. These systems use specialist application software which runs on standard IP hardware and standard operating systems.

Clinical Needs

Clinical needs must be thought of in terms of different time scales.

(a) The Immediate Future

In the immediate future there will be a need to provide much more universal web-based access to primary clinical information (including images), which have been traditionally associated with

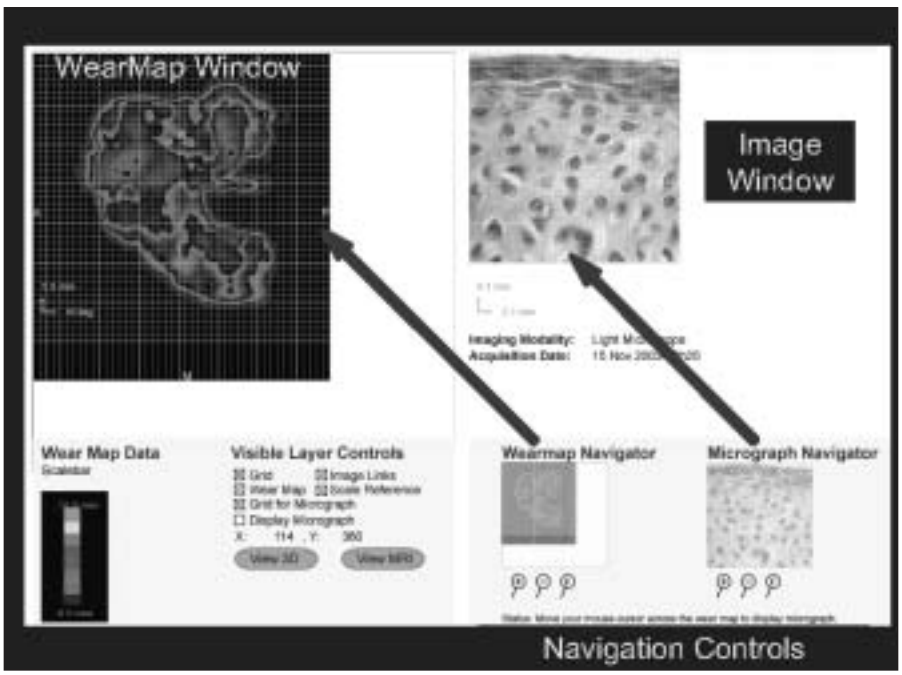


Figure 2: An example of our prototype CIS being used to study Human Knee Cartilage Damage at the Visceral and Tissue Levels

Radiology (eg magnetic resonance imaging, MRI; computed tomography, CT; ultrasound; X-ray; angiography etc) across different clinical specialties, within the hospital. However, there is also a rapidly developing need to provide universal web-based access to a wider range of images from procedures such as general breast screening; minimal access surgery (eg arthroscopy and laparoscopy); the recording of physiological waveforms (eg ECGs, blood pressure, heart rate variability etc); as well as histological and haematological images. In addition, CIS and PACS will need to incorporate photographic images eg retinal images; dermatological images and more general clinical photography. It is important to note that all of these image types are already defined within the DICOM standard.

(b) The Next 5 to 10 years

Over this period the landscape of medicine is set to change radically. These changes are important because the PACS which will be installed in the future must be able to accommodate the changes in clinical practice which are likely to occur over this time frame and beyond.

February 2001 was an important date in the history of medicine. This was the date of the publication of the paper in Nature which reported the initial sequencing of the Human Genome[2]. In many ways this date represents the dawn of the "New Medicine", ie molecular based medicine. From now on there will be a rapidly developing trend away from a data poor to a data rich healthcare environment, and a move away from treating clinically evident disease to diagnosis and treatment based on an understanding of the disease mechanisms. Both of these trends will have a profound effect upon the way in which medicine is practised. There will be an increasing reliance on information technology (CIS and PACS) across many medical specialties involving integrated care.

Central to these developments is the concept of the Biological Continuum ie the hierarchy of the human organism comprising:

- Systems
- Viscera
- Tissue
- Cells
- Proteins
- Genes

Medicine today is often practised at one or two of these levels, ie there is generally no vertically integrated approach. This is set to radically change. The ability to store, view and analyse information at all of these levels will become central to the practice of medicine. Because of the amount and scope of the information, this can only be done effectively by the use of advanced web-based Clinical Information Systems (CIS). Although these systems use web-based technology, in healthcare they usually work on some form of Intranet within the hospital and/or the health system.

Figure 1 illustrates schema for an advanced web-based CIS. In the figure only three of the six levels of the Biological Continuum are shown, for convenience. The schema is divided into two halves. The left half comprises visualisation (ie imaging and 3D reconstruction, as well as items such as physiological waveforms – blood pressure, respiration etc – which in this context can be thought of as images), whilst the right half of the diagram comprises modelling. It should be noted that there are strong interconnections down the levels, as well as interconnection between visualisation and modelling at each level. Modelling refers to computer modelling or simulation (which might well include various types of data analysis of various kinds). For example, computer models can be used to compare patient state in relation to different types of data, either against a population or against the patient's own data – in this case the test for deviations from normality.

Visualisation and imaging across levels often involves using different modalities (ie imaging techniques). Figure 2 illustrates an example of the study of knee damage using our prototype advanced CIS. Referring to the figure, the WearMap window shows a reconstruction of magnetic resonance (MR) images of one surface of a human knee. The colours of the WearMap represent different thicknesses of cartilage across the surface of the joint. By inspecting the WearMap a clinician can detect damaged areas. However, by using the prototype advanced CIS it is possible to examine the damage at the tissue level. Geometric integrity is preserved, even though the tissue images for the patient are light micrographs. The system locks the two sets of images together so that the damage can be studied at different levels of the Biological Continuum.

An additional, important aspect of advanced clinical information systems is that they represent a rich source of data which can be used for epidemiological and management purposes. In the foreseeable future data for a single patient, across the Biological Continuum, will form part of a health system database; which in the case of the UK could comprise the majority of the population. This will enable much more detailed epidemiological and associative studies which, in turn, should lead to much more effective molecular based medicine for the individual.

References:

[1]R. I. Kitney, "The Role of Engineering in the Post-Genomic Age," *The Royal Academy of Engineering*, ISBN. 1-903496-09-8, pp. 1-32, 2003.

[2]E. S. Lander, L. M. Linton, and B. Birren et. al., "Initial sequencing and analysis of the human genome," *Nature*, vol. 409, pp. 860-921, 2001.

Hospitals for the Future:
An Architect's view on effect of new technologies and healing aesthetics

Susan Grant, Architect & Hospital Specialist, Projects Director, Atkins Design & Engineering Solutions

New Hospital design like all architecture is a reflection of the society in which it is set. One measure of any society is how well it treats its old and sick.

In two decades time, our UK population will grow to approximately 65 million, of which near a quarter will be pensioners, with 1.6m over 85. This demographic shift, together with ever increasing expectations of a consumer culture, and the free availability of information will place ever increasing demands on our NHS systems and staff.

Innovations in technology will require to be fully explored if the NHS of the future is to meet the many challenges it will face. Advances in IT, video conferencing and medical equipment will enable the cascading of care out of the traditional hospital into care settings nearer to where people live. This affects not only IT requirements, but also the NHS estate of the future. Discussion of the sort of hospital that there'll be in 30 years time needs not only to focus on questions of location, size and travel times, but also what it will look like.

The Medical Architecture Research Unit identified four levels of healthcare settings which reflect the New NHS Models of Care. At the top level, handling fewer but very intensive and complex cases, are Specialist Care Centres. These new Specialist Care Centres will have a different role from hospitals at present as much of their previous case load will have been moved out to the appropriate local care setting eg Community Health Centre; Social Care Centre; or Home monitoring. The Specialist Care Centre will have fewer beds but provide a higher level of specialist treatment. Centrally located in urban conurbations with good transport links, they will serve large centres of population and will require higher technology capability. They will be physically smaller than the current generation of hospitals but they will be supported by off-site industrial and support zones, which will be more efficient at a larger scale serving several hospitals.

Good hospital design encompasses a great many integrated elements and factors. Even in 1859, Florence Nightingale observed in her prescient "Notes on Nursing" that many symptoms are based on reactions to poor environmental conditions. Her answer was the "pavilion" type ward and hospitals. These had tall windows and ceilings around a single open plan room thereby enhancing good hygiene, lighting and ventilation. This was the model for a century, and many of these buildings are still part of the NHS current estate. Today, however, these wards are obsolete: expectations have changed and patient-centred care puts privacy, dignity and most importantly the safety of the patient first.

Current acute hospital trends are for 25-50 per cent single patient rooms, all with ensuite WC and showers. This is in line with recent infection control guidance. But in the future, we will see 100 per cent single bedrooms, all well-designed and acuity-adaptable, and, of course, all with ensuite WC and shower. We will see patient rooms that are designed to feel light and calm, each incorporating views of art and nature. Patients will have full control of their own environmental conditions directly from their bed. And the bed itself may be used to monitor and record the patient's condition. These new hospitals will also include comfortable family space, designed to improve social support for patients throughout their stay.

As with evidence-based medicine, continual advances in Evidence Based Design research will allow us to evaluate and scientifically quantify environmental design factors and whether they measurably enhance or diminish patient safety, the healing process, staff retention and running costs. The 100% single patient bedroom example above is proven by evidence to result in reduced clinical errors, complications, drugs and improved patient recovery rates. The consequential improvement for a patient's experience, in an "hotel" style room, is a side benefit.

Treatment and diagnostic rooms will evolve too. These technically sophisticated rooms are currently designed to accommodate specialist fixed medical equipment and its operators. They are expensive to construct and expensive to run. They tend to be non-standard, bespoke rooms, located for ease of access in the centre of the hospital complex, resulting often in no views, natural light or ventilation. But things are changing. There is

now a trend to make these rooms mobile, to have theatres and MRI scanners that can be "plugged" into a local health centre for a day or a few weeks, thereby enabling specialist clinical equipment, staff and services to be provided in otherwise uneconomic locations.

Over the next 30 years, evolving medical science is going to push this trend still further. Developments in areas like gene therapy and stem cell regeneration will reduce our reliance on surgery and new medical devices, previously in the realm of Star Trek and science fiction, will become commercially available. This may include hand-held diagnostic scanners; biobeds with built-in biometric sensors and monitors; needle-free injections administered by hypospray, a fine aerosol of medication forced under the skin; and CyberKnife "surgery", a blade-free tool currently being developed by Stanford University.

The mobility and non-invasive nature of these new medical devices means we will need fewer bespoke rooms. The hospital of the future will be able to combine treatment rooms with intensive care bedrooms, creating a single patient-centred space and reducing the need for patient transfers with its attendant risks for these generally fewer but highly intensive patients.

In hospital design, change is the norm, not the exception. This means that the hospital of the future will require increased flexibility and efficiency to accommodate medical advances. Universal functions and increased standardisation will permit increased modularisation of specialist rooms. This could mean that the whole building could simply be exchanged for a newer model when desired (say after 40 years, or even five), or that the modules themselves could be upgraded on a regular basis, rather like computer memory slots.

Designing these hospitals of the future will require a much more holistic approach. For instance, there will be greater emphasis on the healthcare environment, and on the need to create therapeutic environments that enhance the healing process for patients, and that create clinical/staff environments that better support and improve morale, recruitment, retention and safety.

There will be greater awareness of the resource efficiency that good design can bring about. For example, good design can save clinical staff up to two hours a day in walking time, a huge efficiency gain that has been conjectured but which now has been scientifically proven through Evidence Based Design research undertaken by Professor Roger Ulrich and others.

Underpinning all elements of the design will be sustainability – social and economic sustainability as well as environmental sustainability. Currently in the UK, funding for new healthcare facilities is divided up according to the following ratios: design – 0.1; construction – 1; facilities maintenance – 5; operational costs – 100.

But good design contributes significantly to sustainability and the argument for reviewing these weightings is strengthening. With more funding put towards the initial design and towards assessing the sustainability of a proposed layout at design stage our future hospitals will gain significant cost savings and resource efficiencies across their whole life. The operational ratio is likely to be significantly lower than 100.

So what of the building envelope that will encase these new-look and new-feel hospitals? Our future hospitals have the potential to utilise entirely new architectural forms and materials. This will reflect their high tech nature, their more flexible use, and their higher level of intensive patient care, as well as their reduced massing, human scale and enhanced patient-centred design. Innovative sustainable design principles will undoubtedly be key, as will the requirement to ensure that the design not only addresses healthcare needs, but also makes a significant contribution to the pride and civic architecture of the local community.

No-one can predict the future with certainty, nor the challenges and opportunities it will bring. One thing is clear though, the challenge of making sure that the NHS's estate is fit for the future is one which requires serious thought, today, as we embark on a vast expansion in healthcare building.

In discussion the following points were made:

As this meeting was about the future, more questions were asked than answers provided. There is no doubt that there will be an enormous increase in the amount of digital data of every type generated, circulated and ultimately approved for storage and later use. The question is how is this to be stored and how quickly will it be retrieved when required? The ownership of the data should be decided on the basis that if the NHS generate the data, then it is their data and they can re-use it in future research when studying the underlying causes of disease which is essential if medical science is to progress. Indeed patients to whom this has been explained have raised no objection to data concerning them being re-used in this way. Standard storage media are now widely used which increase the flexibility and availability of the data to those with a need to know such as the A and E Department for example.

Wards will be replaced by single bedrooms which can be individually ventilated and managed to reduce greatly the potential cross-infections such as SARS and hospital-generated diseases such as MRSA. Their usefulness in dealing with a pandemic however was questioned as they would be swamped by the large numbers of people requiring treatment. The training of hospital managers, or lack of it, was perceived as being the primary cause of differences in the utilisation of hospital resources between the independent sector and the NHS. Indeed much more attention should be paid in future to the specific needs of top quality management by the NHS, which should be streamlined, so that it can achieve its full potential and deliver the service that it is already equipped to do from the staffing, technical and intellectual points of view. The physicians themselves are the best people to communicate this change as they understand what is proposed, know the importance of it and have the authority to carry it through.

The Annual Lunch was held on Wednesday 1st March 2006

Lord Soulsby, the President, welcomed Members and their Guests to the Annual Lunch at the Savoy, in the 67th year of the Associate All Party Parliamentary Group. He extended a special welcome to the Guests of the Committee, including Research Council Chairmen, Sir Anthony Cleaver MRC, Professor Julia Higgins EPSRC, Dr Rob Margetts NERC, Dr Peter Ringrose BBSRC and Mr Peter Warry PPARC and Departmental Chief Scientific Advisers, Professor Roy Anderson MoD, Professor Gordon Conway DfID, and Professor Paul Wiles HO.

Lord Soulsby remembered that last year he had been delighted to welcome HRH The Princess Royal, as Guest of Honour. She had acknowledged that she had been prevailed upon by one of our members, a very distinguished role model for women in engineering, Baroness Platt of Writtle, to become Patron of WISE, which encourages women to consider careers in science and engineering. Indeed, HRH had gone so far as to conclude that we could solve the problem of the falling uptake of Science and Engineering by focusing our attention on women.

Lord Soulsby explained how Lord May had recently pointed out in the House of Lords that investments in research and development have large payoffs in terms of growth and that investments in R&D are estimated to account for half or more of the increase in output per person. He also particularly welcomed Lord Sainsbury, who has done so much to encourage and promote investments in science for our future prosperity. "His unique contribution requires a very special mention. We also look forward to his presence in a couple of weeks at our Seminar held in National Science Week in which he has indicated a personal interest. The Parliamentary and Scientific

Lord Rees addresses members of the Committee and their guests

Committee is renowned for the breadth of vision and scope of its scientific interests, untrammelled by arbitrary and sector boundaries. It is in this context that a welcome is extended to the Guest of Honour, Lord Rees, The President of the Royal Society and Astronomer Royal and the prolific author or co-author of about 500 research papers, mainly on astrophysics and cosmology, as well as seven books."

Lord Soulsby then referred to Lord Rees' book published in 2003 entitled Our Final Hour – a scientist's warning: how terror, error and environmental disaster threaten humankind's future in this century – on earth and beyond. The theme of this book is that humanity is more at risk than at any earlier phase in its history. This was predicted by him before the tragic events related to the Boxing Day Tsunami or the increasing threats to birds from Bird Flu. "We are very pleased to welcome him here today and we now look forward with great interest to his presentation." Lord Rees set the scene for his presentation which follows, with a story. After an astronomy lecture, an anxious questioner asked the speaker: "How long did you say it would be before the Sun burns the Earth to a crisp?" "Six billion years," responded the lecturer. The questioner was relieved: "thank God for that – I thought you said six million". That's a cosmic perspective: but in politics a week is a long time – as Harold Wilson famously said.

Lord Rees made the promise that "I won't inflict billions – or even millions of years – on parliamentarians. But I'd like this afternoon to contemplate what Harold Wilson would have deemed an eternity – the next few decades.

Politicians can't escape making decisions now that resonate decades ahead – indeed these are often the most important ones. In energy policy, for instance, power stations commissioned today could last until 2050; current CO_2 emissions will affect the climate in the 22nd century. Another topical issue with long-term ramifications is Adair Turner's proposed pension reforms. What will this country be like in 2050? What will the average lifespan be? Global geopolitics and demography may then be quite different.

But we can confidently guess one thing: today's young people will live out their days in a world even more dependent on technology than ours – but change is so fast that we don't know what these technologies will be.

Britain can properly be proud that so much of the science that moulded our present world germinated in this country: Faraday and Maxwell, the electron, splitting the atom, the computer the double helix – all these figure large in the annals of the Royal Society.

How can we ensure that the UK retains a competitive advantage in the coming decades? How can we reduce the uncertainties in our forecasts?

One of the Royal Society's priorities is to engage in "horizon scanning" – to draw on the best expertise to identify long-term challenges with a scientific dimension. It recently focused on one futuristic development: nanotechnology. This study, collaborative with the Royal Academy of Engineering, also drew input from way beyond the scientific and technical community. It was an exercise in what's sometimes called "upstream engagement" – it aimed to pre-empt the kind of polarised and unconstructive sloganising that surrounded (for instance) GM crops, by identifying potential risks (inhaling nanoparticles), and allaying undue concerns ("grey goo" and suchlike), before commercial interests became involved and positions entrenched. Public acceptability is crucial to the successful exploitation of any innovation.

This country still punches above its weight scientifically – but the global competition is strengthening fast. The Government has set a target for continuing real growth in R and D until 2014, with the overall, very ambitious, aim of raising combined expenditure by the public and private sector to 2.5 per cent of GDP. At the moment, we're not even in the top 10 OECD countries by this measure – indeed we're below the EU average.

Our national future will be bleak if we don't continue to excel in science and innovation. Sustained expanding investment is essential – but other things are as well.

Our universities are a crucial asset. One should of course be cynical about the spurious precision of the university "league tables", even when one's own institution comes out top; but however one tots up the scores, the UK is way ahead of any country on mainland Europe – indeed ahead of any country apart from the USA – in the quality of our best universities. That's a competitive advantage we should cherish.

There's not a trade-off between excellence and wider participation – on the contrary, just as in the arts, or in the Olympics we'll only achieve world-class peak performances by seeking out and accessing all talent, and offering a whole range of educational opportunities.

But the balance of subjects is important. A-levels in maths, physics and chemistry were last year down by 37,000 compared to 1991. This is reflected in undergraduate numbers. There's been a rise in computer science and biology, but fewer are reading physics, chemistry and maths. We risk a downward spiral in the number of teachers in these core subjects – crucial for all future scientists and engineers – if too few new graduates enter the profession to replace those who retire.

Efforts to combat this very serious concern must stay high on the Government's agenda. There are exciting innovations in the curriculum, learning centres, and the like. Sir Alan Wilson, former Vice Chancellor of Leeds University, is advising DfES on science education. The Royal Society is doing what it can to ensure that he, DfES and the OST have independent input from the science and engineering community.

This is a problem that the Americans have too. A committee of the American Academies, including the Chairman of Intel and many other heavyweight figures, recently published a report, "Rising above the Gathering Storm". It advocates an urgent programme to attract far more teachers, and that all foreign students who graduate in the US should be given expedited green cards to keep them in the country. They also recommended increased federal investment in the physical sciences, and a new agency to sponsor energy research.

In partial response, President Bush placed science and maths education at the heart of the "American

Lord Soulsby introduces the Guest of Honour

Lord Broers, Sir William Stewart and Mr Phil Willis MP

Competitive Initiative" announced in his State of the Union Address. The driving concern of this US committee was anxiety about the long-term challenge from China and India.

One of the Royal Society's distinguished overseas members is Prof Mashelkar, chief scientist to the government of India. Mashelkar believes that India will become a scientific superpower by 2020. That vast country produces, each year, tens of thousands of highly motivated graduates. That's why 100 global companies have set up R and D centres in India – that's why Intel's new chips are being designed there.

If the Americans are anxious about long-term competition from the Far East, we should be doubly so. If we are to find a niche still higher up the value chain we need to aim high indeed.

In research and innovation, the law of increasing returns applies. Excellence feeds on itself; successful ventures cluster together. It's surely in the national interest to match the blandishments of the US, and make Britain a destination of choice for mobile talent and high-tech investment. Already we have some successes: 7 per cent of all European Venture Capital is invested in the cluster of companies around Cambridge – described by the FT as a "low risk place to do high risk things". Optimising these prospects is of course a complex matter of grants, tax incentives, and the like. (Incidentally, the funding of physical sciences is perhaps more precarious than that of the biomedical sciences, where the Wellcome Trust, the medical charities, and the pharmaceutical industry complement government funding in a manner that has no full parallel for physical scientists.)

But there's a basic prerequisite: the sciences must continue to attract their share of the brightest young talent. And our universities must teach them well. The young are not immune to financial incentives, but they're idealistic as well: they need to feel that science is humanly relevant – that it meets their ethical concerns. And here, a confluence of positive trends make me optimistic. The technologies that now fuel economic growth, IT and biotech, offer fascinating intellectual challenges – as eloquently explained in Alec Broers' splendid Reith Lectures last year. Moreover, these technologies are environmentally and socially benign. They're sparing of energy, and of raw materials. They boost quality of life in the developing as well as the developed world.

Moreover, the challenge of global warming should stimulate a whole raft of manifestly benign innovations – for conserving energy, and generating it by novel "clean" means. These will surely be the "growth points" of global science and technology in the coming decades.

I started with an astronomer's perspective, and I'll finish with it too. The vision of nature offered by Darwin and modern cosmology is an inspiring one – the chain of emergent complexity leading from some mysterious beginning to stars, planets, biospheres and human brains. Those who can't marvel at this are culturally deprived. The entire 21st century is a mere one hundredth of one millionth of the Earth's lifetime. But it is the most crucial century of all for our planet – the first when its fate depends on human actions. Earth's optimum stewardship, and a proper sharing of the benefits of science between all nations, are goals to inspire the young – and goals where, in our own interest, the UK should seize the chance to play a pivotal role.

THE SCIENCE WEEK SEMINAR – TUESDAY 14TH MARCH 2006

SCIENCE AND SOCIETY

The National Science Week Seminar is an annual event hosted by the Parliamentary and Scientific Committee and supported by the Department of Trade and Industry. This is an opportunity to bring together leading scientists and parliamentarians to discuss public policy in the development of science and technology in the UK. This year's theme is Science and Society and the subjects include the Government's programme for science funding, the use of animals in testing, the Royal Society MP-Scientist pairing scheme, public engagement with science, stem cells in research and sustainable energy. The speakers emphasised the importance of communicating the benefits of their work with the public.

The joint chairmen were Lord Sainsbury of Turville, Minister for Science, and Dr Ian Gibson MP, Vice-President, Parliamentary and Scientific Committee. The meeting was held in One Birdcage Walk, the Institution of Mechanical Engineers.

Report by Robert Freer, The Royal Institution of Great Britain

Introduction

Lord Sainsbury of Turville, Minister for Science

Lord Sainsbury opened the meeting, welcomed the audience and thanked the Parliamentary and Scientific Committee for hosting this event during National Science Week. Success in science is a key part of the Government's agenda and is vital to Britain's economic prosperity and in advancing its policy objectives such as health care, improving the environment and international development. The quality of UK science is a major national asset, and the Government has taken steps to increase the science budget from £1.3 billion in 1997 to £3.4 billion by 2008. Under the Government's 10 year programme for science investment the level of knowledge intensity, as measured by the ratio of R&D to GDP, will increase from 1.9% at present to 2.5% by 2014. It is important to communicate to people the opportunities that science is opening up today and to ensure that the safety, ethical and environmental issues raised by these new developments are debated publicly at an early stage.

Controversial areas of science to be discussed today include animal experimentation and stem cell research and these two areas illustrate the Government's approach. In new areas of science it is not for Government to restrict or restrain technical developments although the Government must respond to public concerns and engage with the ethical, safety and environmental issues they raise.

The Government is clear that animal research is necessary in key areas like drug discovery and is required to maintain the UK's position as a world leader. Effective scientific alternatives for animal models guided by the 3Rs, Refinement, Reduction and Replacement should also be investigated. The DTI have established a National Centre for the 3Rs and funding for this centre will rise to £1.3 million for the next financial year. The Government will continue to protect those doing this work by legal and democratic means and new powers were introduced on 1 July 2005 to strengthen significantly police powers to deal with harassment and those causing economic damage. A special police unit has been set up and these new measures have resulted in the arrest of seven individuals. The battle against the extremists is being won and it is encouraging to see young people taking a stand in favour of scientific progress. The Oxford animal house will be built.

Stem cell research is an exciting new area of science which has the potential to provide treatments to help many people with serious diseases for whom there is no cure at present. The Government has a long-term commitment to support stem cell research and the development of therapies. A UK stem cell initiative has been developed to bring all the players together to create a coherent UK funding strategy. The Government wishes to advance research using all sources of stem cells while ensuring that their use is safeguarded by a comprehensive regulatory regime while also recognising that there are many complex ethical issues which arise from this research. A liberal but carefully regulated system is now in place which allows embryo research for therapeutic purposes while reproductive cloning is banned.

The 3Rs- Ethical Principles for Animal Use in Science

Dr Vicky Robinson, Chief Executive of NC3Rs

The use of animals for scientific research and testing in laboratories is an emotional subject. Scientists use a balanced and ethical approach to animal testing recognising that there are a number of competing pressures such as science, medical research,

human health and new medicines on the one hand and the effect on animals on the other. The use of animals in testing is needed for the foreseeable future but it is also necessary to observe the framework of the 3Rs (Refinement, Reduction, Replacement), a concept first proposed in the 1950s and now enshrined in the Animal Scientific Procedures Act.

The National Centre for the 3Rs was set up in May 2004 by Lord Sainsbury with funding mainly from the Office of Science and Technology and also from industries and charities. The Centre funds research and other activities such as information and training and has made grants totalling £1.5 million for 3Rs research.

The Home Office statistics show that in 2004 2.85m animals were used in research, 83% were rodents but other animals were used as well. The numbers declined initially from the 1970s but have increased recently as more genetically modified animals are being used. The use of animals is necessary in many areas of biological and medical research but in practice animals do not always provide good models for scientific experiments. There are limitations to their usefulness and there is a scientific as well as an ethical need to find alternatives.

The welfare of animals is a matter of practical concern for scientists. For example, a study in Scandinavia on dogs designed to measure the effect of a low sodium diet on blood pressure produced variable results which were attributed to their poor environment which caused them to be stressed. When the dogs were provided with better housing and a more stimulating environment the research results were better. Transgenic mouse models were applied to Huntingdon's Disease. Mice kept in a complex environment developed the disease much more slowly; they mimic the human disease much more accurately than those kept in a barren environment. It follows that being humane to animals is essential, not only for the animals' sake, but it is also a requirement for good science.

The principle of the 3Rs is important for science and for public opinion. A survey of the public in 2005 by the Coalition for Medical Progress showed that the majority of people accept the use of animals in medical research provided there is no alternative. The Centre is also funding work to identify signs of pain in animals. This is not easy. Many animals including rodents can show signs of suffering, but if you cannot identify pain you cannot provide animals with the appropriate analgesia. The Centre has funded work to find out whether there are behaviour patterns which are specific to animals' pain. Arching of the back is an unique indication of an animal in pain. We are now looking for similar behaviour in animals which have tumours; this is important because in 2004, 11% of all procedures on animals in the UK were for cancer research. Animal tests are likely to increase in the future and there are many competing pressures in this work. It is important to balance these developments with increased investment in the 3Rs.

Scientific Interchange between the House and the Lab

The Royal Society MP-Scientist Pairing Scheme Members at work

Dr Brian Iddon MP

Dr Iddon presented two examples of the type of work MPs may undertake when they become involved with academic, industrial and educational activities. The first example is the Royal Society MP-Scientist Pairing Scheme which brings together MPs and academics to enable both to learn more about each other's work. This scheme is successful, it has been running for 5 years and is growing in stature. The selected academic shadows the MP during his week in Westminster and in his constituency and sees something about the development of science policy. As his first

Dr Brian Iddon MP and Dr Charles Eaton

example Dr Iddon introduced his own pair, Dr Charles Eaton, a mathematician from the University of Manchester.

Dr Charles Eaton, RS University Research Fellow, Manchester University

Dr Eaton said he had spent a week in Parliament, 12 hours a day from Monday to Thursday shadowing Dr Iddon. This was a fantastic opportunity to learn how Parliament works and is one of the best aspects of the scheme. He had been very fortunate that Dr Iddon had invited him to attend a meeting of the Science and Technology Select Committee, a session in the DTI and a meeting of the Parliamentary and Scientific Committee. Other participants in the scheme had attended a meeting where a Minister was being lobbied on bird flu and yet another had attended a meeting where Michael Howard was being prepared for Prime Minister's Questions.

Dr Iddon's second example was Paul Abbott, previously a teacher in a local secondary school but who had a dream to create a centre for scientists similar to a music centre which recognises that a child who wishes to excel at music cannot always do so in their own school. Dr Iddon said that many years ago in the 1970s he had helped to establish the Bolton music centre. Children usually excel far more when they are brought together in a specialist environment than they do in their own schools. Paul Abbott's dream is to do the same for science, engineering and technology, and with the help of Lord Puttnam and the North West Regional Development Agency, a fine new building costing £3 million called the Bolton Technical Innovation Centre has been built. Although the building costs are paid ongoing funds from industry are badly needed to pay the running costs. Ruth Kelly, a Bolton West MP and Secretary of State for Education, and her department have been particularly helpful, but funds from elsewhere are urgently needed to maintain it in future.

This centre provides close interaction between education and industry and could be a model for others to follow. Children are naturally innovative and designed and built a computer trolley which was much cheaper than the commercial alternative.

Paul Abbott, Director & General Manager, Bolton Technical Innovation Centre

In a music centre students have access to expert tuition and we are trying to do the same for science. Children love science and engineering if they get half a chance. It is important to link the natural creativity of children with the new technologies of today, and enable them to make things and not only to design them. A sense of wonder about science gives children the opportunity to pursue their dreams and to apply what they learn.

Paul Abbott

Bolton South East is not a well-to-do area, there is no sixth form provision. The Centre is a home for new innovators with capability and not only in engineering. Europe's first high definition 3D colour printer is used here in printing software and the products have attracted commercial interest. It is intended to open the centre in the school holidays and Saturday morning science clubs have commenced. A Chemistry Day hosted 20 schools from across the region. A generation of highly motivated teachers is needed to inspire the next generation of children. Money is also required to run the Centre which exists at the boundary between education and industry, where innovation happens. It falls outside all the conventional funding mechanisms and it is struggling to exist, like a Rolls Royce with no fuel in the tank.

Public Engagement for a Better Quality of Life

Professor Kathy Sykes, Collier Professor for the Engagement of Science and Engineering, Institute for Advanced Studies, University of Bristol.

Since the 1980s there has been a huge increase in public engagement in science. There are now more science journalists, more science centres and festivals, more science books and the National Science Week. The House of Lords Select Committee report on Science in Society in 2000 recognised that the public are positive about science and recognise the need for research. They

identified a crisis of confidence and a need for better dialogue with the public.

For example, in 1996 tins of GM soup were available in shops, but by 1999 GM foods had become a contentious issue. The media then published complaints about GM foods rather than presenting an unbiased view. Protesters became more active and attacked a field of GM crops in 2001. Most countries have concerns about GM and have signed protocols to ensure biosafety and to undertake to engage with the public as part of the process. Success of science depends on dialogue with the public. Too many debates are driven by the media, discussions are seldom well informed. Research shows that groups insulated from outside information make bad decisions. Public engagement leads to a better quality of life, especially in a wealth creating society.

What is dialogue? The purpose is to explore issues when shaping policy, it is not about the public making the decisions. Dialogue is a structured process to try to engage a diverse range of different people with open minds. When should dialogue be undertaken? Scientists now acknowledge the need to talk to the public at the initial stages when thy are exploring aspirations and concerns. This is not about the public making the decisions.

The Sciencewise team within the DTI has a programme to improve public dialogue across Government departments and embed good practice therein. A number of topics and initiatives are being funded. The Council for Science and Technology has included nanotechnology as a topic for public discussion before it hits the media. Research Councils and others are finding ways to listen to the public, including the use of social scientists to work with the research workers. Considerable progress has been made with public discussions to ensure a better planetary environment in the future.

Stem Cells
What does human embryonic stem cell research offer for our future?

Professor Alison Murdoch, Professor of Reproductive Medicine, BioScience Centre, International Centre for Life, University of Newcastle upon Tyne

Stem cells and embryonic stem cells are both subjects that attract public concern. All life starts as a single cell which contains the total genetic code to make all parts of the finished structure. For instance, in a tree there are genes to make roots and different genes to make branches. The roots start to grow when the appropriate genes are switched on, and it is important to understand how these cells are switched on and off.

Work on stem cells is important because many human diseases are caused by the absence, for various reasons, of certain cells. For instance, diabetes is caused by the absence of the cells which make insulin. And although diabetes can be partly treated by medication it is better to make new insulin cells and put them back into the body. Another example is to use stem cells in the replacement of the liver; this is important in Newcastle where over the last twenty years alcoholism has become a problem among the young and there are several cases of liver failure. Developing new nerve cells would enable nerves to work again. Stem cells also have the benefit that they open up new ways of doing research. Research can now be carried out on the cells in the laboratory instead of on the patient. For instance, red blood cells can be grown in a test tube in the laboratory and if this process could be expanded to an industrial scale to produce blood of sufficient quantity and quality, it would replace the need for blood transfusions.

One problem is that embryonic stem cells might be rejected by the recipient. The solution is nuclear reprogramming where the nucleus is removed from a cell taken from a patient and put into a donated egg which has had its own nucleus removed, which the press refer to as therapeutic cloning. A stem cell colony will grow which matches the patient's nucleus and the patient won't reject it. This process is similar to pressing the reformat button on the computer. Disease-specific stem cells can also be made and then studied in the laboratory rather than in the patient. Newcastle is the only unit working on nuclear transfer and has the only published paper in the world on this topic. Stem cell therapies have been in use for 50 years, bone marrow transplants started in the 1950s. However, managing the expectations of this type of research is important because the public often expect too much too soon.

Adult stem cells are capable of further development but they cannot go in reverse. For example, bone marrow is an adult stem cell in human terms and can make all blood products but cannot make bones or skin. At present all the treatments relating to stem cells are in adults but the potential for embryonic stem cells is such that in 20 years' time most of the products coming from them will be the subject of investigation.

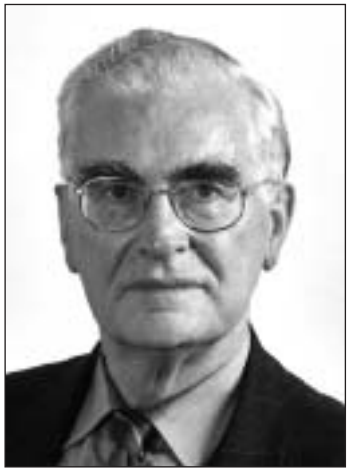
In IVF treatment egg and sperm are brought together. Some spare embryos can be frozen but others are discarded and could be used for

research. 85% of 500 patients surveyed agreed with this procedure, recognising that treatment is presently possible as a result of research in the past.

The UK leads the world in this field, based on the Human Fertilisation Act of 1990 which recognised research on embryos as a sufficient benefit to society. In 1990 no one had heard of stem cells, so the Act was modified in 2002 to include stem cells and also nuclear transfer. There is an opportunity here to lead the world on nuclear transfer, and more resources are needed or the lead will be lost. The work is undertaken in the Stem Cell Institute in a building in the middle of Newcastle which also houses a Visitors Centre. The public appear less intimidated by what is done here in the city centre and appreciate the work.

Sustainable Energy Sources Compatible with Climate Change

Diversity as the basis for future success



The Lord Oxburgh FRS FREng

Lord Oxburgh said the concept of sustainable energy has to be considered in relation to the increasing world population and the declining availability of cheap fossil fuels. The world population may eventually stabilise at about 9 billion people, compared with just over 6 billion today, and fossil fuels provide most of the world's energy, a situation which cannot be changed overnight.

The reserves of oil and gas are finite but will eventually become too expensive to extract. The reserves of coal are much larger and are concentrated in those countries where the energy demand is greatest, which are China, India and the USA. For China and India coal provides them with the capacity to become major industrial countries, and for the USA coal is a means of ensuring energy security. Fossil fuels will continue to be used for some years. China is building coal fired power stations at the rate of 1GW every five days which produce prodigious amounts of carbon dioxide, and in the UK it is therefore very important to develop ways of burning coal cleanly to set an example to the rest of the world. In an interesting recent experiment in Hawaii carbon dioxide from a power station was passed through a water tank containing GM algae which grow on the gas. When dried the algae can be made into bio-diesel.

Fuels for vehicles need to have a high energy density and petrol is ideal for this purpose. Synthetic alternatives for petrol can be made out of almost any organic material or bio-mass but growing crops especially for fuel is unlikely to be successful because the land will be needed for growing food. A better solution would be to grow a crop which provides both food and fuel. Municipal Solid Waste is another useful source of energy but wind energy and wave energy are intermittent sources which will need some form of energy storage.

Aviation fuel is particularly difficult to replace because aircraft engines have been designed to optimise their performance using kerosene as the fuel. Changing to an alternative fuel may require engines to be re-designed.

Modern nuclear power stations are much better than the earlier designs and there is no significant problem with safety, but the management of waste is still a social and political, rather than a technical, issue. It would be surprising if nuclear power was not part of our future energy mix.

In closing the meeting **Dr Ian Gibson** thanked all the participants and said the presentations demonstrated that we need to continue to discuss science strategy and to develop the prime role British science has in future in improving our lives and those in developing countries.

In discussion the following points were raised:

Increase in the use of animal models; the benefits of animal testing; long term effect of the RS pairing scheme; self funding the BTIC; media claim to represent the public; methods to engage the public; examples of change of opinion; effect of financial restraints; promotional agency for science; political process needs to be embedded; media neglect of benefits of GM crops; too many acronyms; influence of risk and probability; success of nuclear transfer; question of intelligent design; risks in nuclear power stations get disproportionate public attention compared with more serious problems in coal mining; pioneers in new energy technologies have difficulty getting funding.

Making an Impact

Jim Cousins MP

In the Spring 2002 edition of Science in Parliament the Royal Society reported on the first year of its MP-Scientist Pairing Scheme, established to build bridges between bright young scientists and members of the UK Parliament. The scheme has flourished and has attracted nearly 200 MP and scientist participants. It brings added value to both MPs and young scientists; it provides MPs with an opportunity to gain an understanding of how science is done and create new links with local universities or research institutes. It also gives scientists an insight into political issues and the science policy making process.

But the scheme is not just about building bridges. It can also bear directly on practical issues. In 2004, I was paired with Dr Hayley Fowler from the School of Civil Engineering and Geosciences at the University of Newcastle. Hayley's research has shown that extreme rainfall events in the northeast region increased in magnitude by a factor of two during the 1990s. We discussed this in the context of local flooding and drainage capacity problems. With future climate change, it is projected that extreme rainfall events and flooding will increase further. Flooding and drainage issues hold considerable importance for local planning issues; and are often not well explained to the public.

I know that other pairings have also proved fruitful. A number of scientists have gone on to have an active involvement in policy making as Dr Joanne Baker, another participant from 2004 explains:

"Since taking part in the scheme, I have had a lot of involvement with Parliament and parliamentary bodies. I have contributed to POST notes for a project on Horizon Scanning and a study of Parliamentary Questions on science topics."

Going back further Dr Rachel Flecker of the University of Bristol took part in 2001. She has since gone on a secondment to the Environmental Technologies Unit at DEFRA where she helped get the Unit up and running, and organised a high profile UK-Sweden workshop on Environmental Technologies. She played a central role in shaping discussions between Ministers, officials, academics, industry and NGOs.

Dr Hayley Fowler, Senior Research Associate in the Water Resource Systems Research Laboratory, School of Civil Engineering and Geosciences at Newcastle University:

The scheme really opened my eyes to what politicians do. I was amazed by how hard they work and how much they care about their constituencies. What really surprised me was the breadth of knowledge that politicians are expected to have. It was great to get a sense of how we as scientists can become players in the political process and can try to influence science policy making.

I am now much more interested in being involved in communicating science to politicians and getting the results of scientific investigations into the public domain. I was therefore pleased to bring to Jim's attention work that we are doing on issues like sediment accumulation and changing patterns of extreme rainfall and their potential impact on flooding and water quality issues.

I also attended an international climate change meeting in Switzerland last November aimed at producing recommendations for politicians in terms of combating or adapting to climate change. The final position of the workshop was brought together in a manifesto on climate change.

Dr Hayley Fowler and Jim Cousins MP

The MP-Scientist Pairing Scheme forms part of the Royal Society's Science in Society programme, which is celebrating the completion of its first five year phase this year, funded by the Kohn Foundation. If you are interested in finding out more about the scheme or the work of the programme please contact Chloe Sheppard at the Royal Society, 6-9 Carlton House Terrace, London, SW1Y 5AG.
Alternatively, email chloe.sheppard@royalsoc.ac.uk, telephone 020 7451 2573 or visit our website at www.royalsoc.ac.uk

UK and US: partners in science and innovation in a global economy

Julian Braithwaite, Counsellor,
Global Issues Group. British Embassy, Washington, D.C.

In an increasingly global economy, scientific invention and innovation are critical to the United Kingdom's long-term competitiveness, prosperity and security.

The United States remains at the centre of global science, technology and innovation. The total flow of R&D investment between the UK and the US is larger than between any other two countries in the world – approximately £2.2 billion in each direction. With only 5% of the world's population, the US accounts for 44% of the combined R&D spending of the 30 OECD countries. Public and private research and development funding in America reached a record $328 billion in 2005. The US attracts many of the world's best scientists and engineers and remains the world's leading producer of innovative products.

That is why of the 75 dedicated Science and Innovation Officers in 22 countries around the world, nearly a sixth of them are based in the US. And the majority of these officers are located close to the powerhouses of US innovation and scientific research, where universities, government laboratories, industrial laboratories and small businesses merge into regional centres of excellence: Boston, San Francisco, Houston, Los Angeles and Atlanta, as well as Washington DC.

The scope of our US Network is bound by a set of objectives intended to ensure that the Officers are working effectively at the cutting edge of science. These currently include work on homeland security technologies, stem cell research, innovation and technology transfer, pandemic contingency planning, climate change science and new energy technologies.

The UK's science base and our innovation industries are held in high regard in the US, a reputation that has been strengthened by recent developments. In the past year, biomedical research has progressed rapidly with government support. For example, the £100 million UK Stem Cell Initiative shows our American colleagues that the UK intends to maintain its lead in this field through pioneering endeavours such as the UK stem cell bank and the establishment of a public-private consortium to use stem cells to enhance drug discovery and development. The UK has also achieved remarkable results in space science with the landing of the Huygens probe on Titan, in nanotechnology with the development of new architectures for devices in biomedicine and information technology and in ICT with the award-winning Visa4UK system.

Our S&I Officers and Public Affairs Officers have used these accomplishments, among others, as leverage to forge connections with American research centres, universities, government programmes and private industry in their patches.

Through introductions made by Atlanta's S&I Officer, three UK genomics/proteomics networks and a University of Georgia-led consortium have agreed to form a global alliance to further research into the area of structural genomics and proteomics.

In San Francisco, the S&I team's activities have brought UK collaboration with the fledgling California Institute for Regenerative Medicine, responsible for $3 billion of stem cell research funding, to a new level.

Houston S&I has organised a US-UK Conference on Climate Change science and policy with FCO support, and a visit for key US climate scientists and government representatives to participate in the Climate Agency conference in London.

Our team in Washington has led the Network on UK-US collaboration under the S&T Agreement for homeland security: for example, working with the Home Office and British Defence Staff, to advance a promising new line of UK-US collaboration vital to the security of both nations.

In March 2006, the Network organised a visit to Washington DC and New York by the House of Commons S&T Committee as part of the Committee's inquiry into how Government uses scientific evidence for policy making. The Committee, chaired by Phil Willis MP, received a variety of views from Congressmen, senior US Government officials and representatives of many non-governmental bodies.

The importance of the United States for the advancement of science cannot be underestimated; the FCO will continue to develop its S&I Network in the US to ensure that the United Kingdom is not only aware of the developments coming from across the Atlantic, but also takes advantage of every opportunity for collaboration and knowledge exchange.

In an ever-broadening global economy, strong partnerships such as these will be essential for the development of the UK economy, and the science base that increasingly lies at its heart.

Let's prevent neural tube defects by fortifying flour

Baroness Walmsley, with thanks to Professor Nicholas Wald FRS, Director, Wolfson Institute of Preventive Medicine

On 23 November, the Scientific Advisory Committee on Nutrition (SACN) released a report on folate and disease prevention for public consultation. The Committee recommends the mandatory fortification of flour with folic acid, a B-vitamin. The Food Standards Agency will be considering their advice in the coming months.

In Britain neural tube defects remain an important cause of birth defects. Neural tube defects are mainly of two types – anencephaly and spina bifida. Anencephaly is a severe malformation in which a large portion of the top of the brain and skull is missing, and it is always fatal at birth or shortly afterwards. Spina bifida is a defect of the lower portion of the spine that can lead to paralysis of the lower limbs, incontinence, and development of hydrocephalus (water on the brain). Spina bifida and anencephaly account for about 1400 affected pregnancies in the United Kingdom each year. Although the numbers of affected births have been reduced by antenatal screening and elective abortion, it remains an important public health problem.

Although many individuals with neural tube defects are much loved and have fulfilling lives, it would clearly be far better to prevent such disabilities if possible. And it is possible. Research published in 1991 showed that about three quarters of pregnancies with neural tube defects could be prevented if women consumed sufficient amounts of folic acid immediately before pregnancy.

Currently in the UK however, only about one third of women becoming pregnant have taken folic acid before their pregnancy commenced. All authorities are agreed that the only practical preventive measure is fortification of a staple food, such as flour, with folic acid. Accordingly, about 40 countries throughout the world have taken this sensible public health step through which all women benefit without needing to take a folic acid tablet before becoming pregnant. In the UK the response has been slower. In 2000 the UK government nutrition committee (COMA) concluded that universal folic acid fortification of flour at 240 micrograms per 100 g would have a significant effect on preventing neural tube defect pregnancies. It would probably reduce the risk by about one quarter. Preventing one affected pregnancy a day in the United Kingdom by a simple and inexpensive public health intervention is undoubtedly a step that should be taken with urgency.

Indeed, there is evidence that increasing folic acid intake would have wider public health benefits, including a modest reduction in the risk of cardiovascular disease and possibly also other benefits, including a reduction in the risk of colorectal cancer. Leading experts from Harvard School of Public Health have stated publicly that failure to fortify flour with folic acid represents a major missed public health opportunity.

What is the reason for Britain having delayed the introduction of fortification? There is probably no simple answer. The problem of neural tube defects is largely hidden by the number of elective abortions, and unfortunately accepted when it could be avoided. Over 90% of cases are identified in pregnancy, and lead to an abortion, so regrettably this has emerged as the main method of prevention instead of preventing the disorder from arising in the first place. Abortion should never be relied upon as a means of putting things right if there is a better way. There is a simplistic view that fortifying flour with a vitamin is "unnatural" and appears to impose a public health measure on everyone without choice. However, almost all sensible public health actions involve collective decisions from which we all benefit. Flour is already fortified with two vitamins, and two minerals, without any public objection. The UK Government may feel reluctant about introducing further food fortification for fear of "nanny state" accusations. The response should be that we are a caring society and that where something simple can be done at virtually no expense that will prevent families having pregnancies and children with a severe abnormality this is something that we should support and implement.

Of course we must consider whether there are any medical reasons for not fortifying flour with folic acid. The simple answer is no. The COMA committee, and now SACN, have examined the possible adverse effects of fortification in detail and concluded that there are certainly none at the level of fortification being recommended. Concern about possible risk associated with folic acid fortification arose because of a misplaced worry that it might mask vitamin B12 deficiency, by partially correcting the associated anaemia while allowing the associated neurological problems due to the B12 deficiency to progress untreated. The issue arose at a time before it was possible to measure B12 concentrations in the blood, so B12 deficiency could only easily be detected by the presence of anaemia. Today any suggestion of the early neurological signs of B12 deficiency will prompt a simple blood test that will detect the problem and enable the deficiency to be treated by taking B12 supplements. In any case, concern over the possibility of B12 deficiency in the population is no

good reason for withholding additional folic acid in the diet to prevent neural tube defects.

To quote from a recent article published in the New England Journal of Medicine, "There is no evidence that folic acid fortification at the levels proposed pose a risk to health, and there is compelling evidence that failure to fortify a staple food at an adequate level causes considerable harm."[1]

SACN has endorsed the recommendations of the government committee that preceded it (COMA, 2000).[2] The FSA and health ministers should now move quickly to implement the recommendation.

I hope that, when SACN makes its final report, the FSA and health ministers will move quickly to fortify flour.

[1]. Wald NJ. Folic acid and the prevention of neural-tube defects. N Engl J Med 2004;350:101-3

[2]. Committee on Medical Aspects of Food and Nutrition Policy. Folic acid and the prevention of disease. Department of Health, HMSO London, 2000

Voice of the Future

The first Voice of the Future event of the new Parliament was held in the House of Commons on Tuesday 28 February when literally hundreds of younger scientists and engineers crammed into the Attlee Suite to question the Chair and Members of the Commons Select Committee on Science and Technology in a special Science Question Time with S&T Select Committee MPs chaired by Phil Willis MP.

The young scientists and engineers came from all over the UK and from every major scientific and engineering organisation – including the Royal Society, the Royal Academy of Engineering, the Institute of Physics, the Institute of Biology, the Campaign for Science and Engineering, the Biosciences Federation and many more. They were also addressed by the Minister for Women at the Department for Trade and Industry, Meg Munn MP, who spoke about women in science. The event was organised by the Royal Society of Chemistry.

The topics ranged from UK energy policy and the potential role for nuclear power and renewables, the benefits of vivisection and research on animals, the career paths of scientists, as well as public engagement in science and the supply of future scientists and engineers.

Asked by a young scientist whether a chair of public engagement in science should be created in every university to promote scientific research, the panel of MPs disagreed. The Committee held the view that all those involved in research should play a role in communicating what science is about and what it is that scientists do.

Phil Willis MP and members of the panel

Dr Evan Harris MP suggested that time should be set aside for researchers to take part in such work and that an appropriate credit framework was needed to recognise and reward public engagement work.

In response to a series of questions that highlighted the issues young scientists have about pay, short-term contracts and limited opportunities for career development in academia, Dr Des Turner MP and Dr Brian Iddon MP were both critical of the short-term contract culture now common in this sector. The exchanges between the panel and audience on careers in science prompted Dr Harris to call on the Select Committee to launch a further inquiry into the issue.

On the supply of scientists and engineers for the future, the Committee MPs welcomed the imminent introduction in September of the new GCSE science specifications designed to make the subject more relevant to students. Dr Turner commented that, though financial incentives may help to address the recruitment of teachers, getting the right type of teacher, ie a good scientist as well as a good teacher, is vital.

A member of the large audience asks a question

House of Commons Select Committee on Science and Technology

Under the Standing Orders, the Committee's terms of reference are to examine "the expenditure, policy and administration of the Office of Science and Technology and its associated public bodies".

The new Committee was nominated on 19 July 2005. Members of the Committee are Adam Afriyie (Con, Windsor), Mr Jim Devine (Lab, Livingston), Mr Robert Flello (Lab, Stoke-on-Trent South), Dr Evan Harris (Lib Dem, Oxford West and Abingdon), Dr Brian Iddon (Lab, Bolton South East), Margaret Moran (Lab, Luton South), Mr Brooks Newmark (Con, Braintree), Anne Snelgrove (Lab/Co-op, South Swindon), Bob Spink (Con, Castle Point), Dr Desmond Turner (Lab, Brighton Kemptown), and Mr Phil Willis (Lib Dem, Harrogate and Knaresborough). Mr Phil Willis was elected Chairman of the Committee at its first meeting on 20 July 2005.

Oral Evidence

The corrected transcripts of these evidence sessions are available on the Committee's website.

Science Question Time
The Committee hosted a "Science Question Time" with Lord Sainsbury of Turville on Wednesday 25 January. The Committee will continue to host such sessions at regular intervals.

Chief Executive of the Particle Physics and Astronomy Research Council: Introductory Hearing
The Committee took evidence from Professor Keith Mason, Chief Executive of the Particle Physics and Astronomy Research Council, on Wednesday 18 January.

Current Inquiries

Scientific Advice, Risk and Evidence: How Government Handles Them
On 9 November 2005, the Committee announced an inquiry into scientific advice, risk and evidence. The inquiry is focusing upon the mechanisms in place for the use of scientific advice (including the social sciences) and the way in which the guidelines governing the use of such advice are being applied in practice across Government. The Committee has taken evidence from Sir David King, the Chief Scientific Adviser and Sue Duncan, the Government Chief Social Researcher.

During the course of the inquiry, the Committee is also considering a number of case studies including the technologies supporting the Government's proposals for identity cards, the classification of illegal drugs, and the use of MRI equipment and the EU Physical Agents (Electromagnetic Fields) Directive. The Committee has held evidence sessions with representatives from the Advisory Council on the Misuse of Drugs and the Identity Cards Programme Team from the Home Office. Evidence sessions will continue until June and the Committee expects to report on the case studies in the summer and on the overarching inquiry in the autumn.

Research Council Support for Knowledge Transfer
The Committee announced its terms of reference on 1 December 2005. The inquiry is concentrating upon the effectiveness of the Research Councils' knowledge transfer activities. Terms of reference include the promotion of collaborative working between researchers and partners in industry, stakeholder engagement, results and performance management, and co-ordination between the Councils and the role of RCUK. Oral evidence sessions began in March and continued until the end of April. The Committee expects to report in May.

Chemistry Provision at Sussex University
On 27 March, the Committee held an oral evidence session regarding the changes to chemistry provision at the University of Sussex. Evidence was taken from Professor Alasdair Smith, Vice Chancellor at the University of Sussex, Dr Gerry Lawless, Head of the Chemistry Department at the University of Sussex and Mr Steve Egan, Acting Chief Executive of the Higher Education Funding Council for England. The Committee published a short Report on 4 May as a follow-up to the Committee's Eighth Report of Session 2004-05, ***Strategic Science Provision in English Universities*** (HC 220) and the Second Special Report of Session 2005-06, *Strategic Science Provision in English Universities: The Government Response to the Committee's Eighth Report of Session 2004-05* (HC 428).

Human Enhancement Technologies in Sport
On 1 March, the Committee announced a new inquiry focused on the use of human enhancement technologies (HETs) in sport, with particular reference to technologies which are likely to impact on the 2012 Olympics. The Committee is particularly interested in the opportunities and problems presented by the increasing availability of technologies capable of enhancing sporting performance. The terms of reference include the potential for different HETs to be used legally or otherwise for enhancing sporting performance, the scientific and ethical dimensions of allowing the use of different HETs in sport, the role of the public, Government and Parliament in influencing the regulatory framework for the use of HETs in sport and the state of the UK research and skills base underpinning the development of new HETs. The deadline for written evidence is 22 May and oral evidence sessions will begin in early June.

Research Council Institutes
The Committee announced its terms of reference on 22 March 2006. The inquiry will focus on the Research Councils' strategies for providing support to their institutes and centres. The terms of reference include the role of institutes in maintaining the UK research and skills base, the balance between Research Council expenditure on institutes and grant funding, the different approaches adopted by the Research Councils on supporting the institutes and a review of progress on current reorganisations of institutes such as the Centre for Ecology and Hydrology. The deadline for written evidence is Monday 5 June and oral evidence sessions will begin shortly afterwards.

Reports

Carbon Capture and Storage
The Committee published its First Report of Session 2005-06, *Meeting UK Energy and Climate Needs* (HC 578) on 9 February 2006. The Committee's inquiry had focused on the current state of R&D in CCS technologies, projected timescales for producing market-ready, scalable technologies, cost, geophysical feasibility and the Government's role in funding CCS R&D. The Committee found that there is significant scope for Carbon Capture and Storage (CCS) technology to contribute both to reducing CO_2 emissions in the UK and abroad, and to enhancing the security of the UK's future energy supplies. The Committee concluded that the costs of CCS are comparable to other low carbon approaches to electricity generation and that there is the potential for substantial cost reduction due to technological development, increased experience and economies of scale. The Report encouraged the Government to use the Energy Review to put in place a long-term incentive framework and a policy signal to give industry the confidence to proceed.

Further Information

Further information about the work of the Committee or its current inquires can be obtained from the Clerk of the Committee, Chris Shaw, the Second Clerk, Celia Blacklock, or from the Committee Assistant, Ana Ferreira on 020 7219 2792/0859/2794; or by writing to: The Clerk of the Committee, Science and Technology Committee, House of Commons, 7 Millbank, London SW1P 3JA. Inquiries can also be emailed to scitechcom@parliament.uk. Anyone wishing to be included on the Committee's mailing list should contact the staff of the Committee.

Anyone wishing to submit evidence to the Committee is strongly recommended to obtain a copy of the guidance note first. Guidance on the submission of evidence can be found at http://www.parliament.uk/commons/selcom/witguide.htm. The Committee has a new website address: www.parliament.uk/s&tcom

All recent publications (from May 1997 onwards), terms of reference for all inquiries and press notices are available at this address.

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

The Merchant Shipping (Pollution) Bill

Research Paper 06/04
The Merchant Shipping (Pollution) Bill [HL] will enable the UK to give effect to certain international agreements on pollution from shipping.

Clause 1 will enable the implementation of the Supplementary Fund Protocol which will provide a second tier of compensation for those affected by oil pollution from ships. Clause 2 will enable the implementation of Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL) which introduces controls on the emission of certain air pollutants from ships and off-shore platforms.

The Bill received Royal Assent on 30 March.

The Commons Bill

Research Paper 06/20
The Commons Bill [HL] would change the system for registering common land and town or village greens in England and Wales from that set out by the Commons Registration Act 1965.

It would provide new powers to enable the establishment of commons management associations. These associations would have powers to control agricultural practices and the exercising of certain rights on common land. The Bill also provides greater protection against unauthorised works and agriculture practices on common land and town or village greens and clarifies the regulations that protect unclaimed common land.

House of Lords Science and Technology Select Committee

The members of the Committee (appointed 6 June 2005) are Lord Broers (Chairman), Baroness Finlay of Llandaff, Lord Howie of Troon, Lord Mitchell, Lord Patel, Lord Paul, Baroness Perry of Southwark, Baroness Platt of Writtle, the Earl of Selborne, Baroness Sharp of Guildford, Lord Sutherland of Houndwood, Lord Taverne, Lord Winston and Lord Young of Graffham.

The Reports and Calls for Evidence for the inquiries mentioned below can be found at the Committee's web site www.parliament.uk/hlscience.

Meeting with Energy Minister

On 29 March the Select Committee held a one-off meeting with Energy Minister Malcolm Wicks MP, in the course of which the Government's current energy review, along with the Government's responses to the Committee's previous reports on renewable energy and energy efficiency, were discussed. The transcript of the Minister's evidence will be published shortly, and a debate on the Committee's report on energy efficiency took place on 27 April.

Reports

In addition the Select Committee has recently published two short, but hard-hitting, reports. Its *Annual Report for 2005* (the Committee's first annual report). Along with a summary of the Committee's activities in 2005, it contained a scathing assessment of the quality of Government responses. A particular case in point was the Government response to the Committee's 2005 report on *Ageing: Scientific Aspects*, which was received in November. The fact that the response was issued by Department for Work and Pensions (a department that refused to give evidence to the original inquiry on the grounds that it didn't know anything about the *science* of ageing) set the tone, and as a result the Committee took the unusual step of sending the response out to several of the original witnesses for comment. The Committee's follow-up report, incorporating these comments and the Committee's own critique, duly appeared in March 2006 (6th Report). A debate will follow after Easter.

Water Management

The inquiry into Water Management, which has been conducted by Sub-Committee I under the chairmanship of the Earl of Selborne, is now drawing to a close. The final oral evidence session was held on 28 March, when Elliot Morley MP (Minister for Climate Change and Environment) and Yvette Cooper MP (Minister for Housing and Planning) were questioned about the current water shortages in southern England, the impact of the extra housing growth proposed by the Office of the Deputy Minister and the issue of compulsory metering. The Committee has also heard from the Environment Agency, Ofwat, Water UK and a range of other experts, and has undertaken visits to Australia, Yorkshire, Essex and BedZED. The report is currently being drafted and the Committee will deliberate further in May. It is anticipated that the report will be published in the early part of June, and that publication will be co-ordinated with a meeting of the Foundation for Science and Technology on 6 June to discuss water management.

Science and Heritage

The inquiry by Sub-Committee II into Science and Heritage, which is chaired by Baroness Sharp of Guildford, is now into its stride. An introductory seminar was held on 6 March at Hampton Court, and three public meetings were held later in the month, with witnesses from Government, the Research Councils, academia, and independent bodies. Further meetings will be held in late April, May and early June, and in early May the Committee visited Italy, which has one of Europe's most active and well-funded conservation science communities. The main issue that has emerged so far is the fragmentation of conservation science between museums, galleries, private funders and universities, and the lack of any body with responsibility for taking a strategic overview. It is anticipated that the Committee's report will appear in July.

Progress of Legislation before Parliament

A complete 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 Office of Science and Technology

Recent POST publications

Low carbon private vehicles

January 2006 ***POSTnote 255***

Private vehicle use is increasing. It now accounts for 86% of miles travelled in the UK, compared with just 27% in 1952. Cleaner fuels and exhaust technologies such as catalytic converters have reduced emissions of some vehicle pollutants. However, carbon dioxide (CO_2) emissions continue to rise, with a projected increase of 10% between 2000 and 2010. This POSTnote examines technologies as well as current government initiatives aimed at reducing CO_2 emissions from private vehicles.

Århus Convention

January 2006 ***POSTnote 256***

There is currently a perceived lack of trust between people and their governments, especially where environmental matters are concerned. The Århus Convention is seen as an important tool for improving this situation. It is founded on the belief that citizens' involvement can strengthen democracy and environmental protection. The UN Secretary General has described it as "the most ambitious venture in the area of environmental democracy so far undertaken under the auspices of the United Nations". This POSTnote looks at the progress of introducing the Århus principles into national legislation, the successes achieved and the difficulties encountered.

Healthy Life Expectancy

February 2006 ***POSTnote 257***

Will the UK's ageing population be vibrant and independent, or suffer from greater chronic ill health? A measure called Healthy Life Expectancy (HLE) is commonly used to try to assess this. It is an estimate of how many years are lived in good health over the lifespan. Such data are invaluable for predicting future needs, evaluating health programmes and identifying trends and inequalities. They can inform planning of health and social services, long term care and pensions. This POSTnote reviews the current debate on HLE, outlines possible future scenarios, and looks at the pros and cons of different HLE measures.

The National DNA database

February 2006 ***POSTnote 258***

Over 3 million DNA profiles from individuals are now on the National DNA Database® (NDNAD) and this number continues to increase. A series of legislative changes has contributed to the extensive expansion of the NDNAD. While there is overall support for the Database as an intelligence tool, there is a need to balance the benefits to society and to individual rights. This POSTnote provides an overview of the NDNAD and covers issues such as the retention of samples, ethical oversight of the Database and the extraction of information from DNA.

Balancing water supply and the environment

February 2006 ***POSTnote 259***

Water is vital for all living things. Rivers, lakes and wetlands support a variety of wildlife and habitats. However, the environmental need for water must be balanced against human water use. In most areas of England and Wales this balance is sustainable but in some locations water-based ecosystems are under threat. European Directives aimed at protecting the water environment will have impacts on how human water needs are met. This POSTnote examines the potential risks and opportunities for the provision of public water supply as the Directives are implemented in England and Wales. It preceded the House of Lords Science and Technology Select Committee report on Water Management.

Debating Science

March 2006 ***POSTnote 260***

Recent years have seen an increased awareness of the importance of public engagement with science and technology (S&T). Which science should be funded, how it should be carried out and how it should be used and regulated are all debated questions. But what is meant by public engagement? Can public engagement in policy be achieved effectively without a wider dialogue between scientists and the public? How have methods of public engagement developed, and at what stage in the S&T process are they best applied? How do policy-makers take into account public opinion when using and regulating S&T?

ICT in developing countries

March 2006 ***POSTnote 261***

Information and communication technology (ICT) can help developing countries tackle a wide range of health, social and economic problems. By improving access to information and by enabling communication, ICT can play a role in reaching Millennium Development Goals such as the elimination of extreme poverty, combating serious disease, and achieving universal primary education and gender equality. However, the benefits of ICT are not fully realised in many countries: ICT is often out of reach of the poor and those in rural areas. This POSTnote discusses how this problem is being addressed, focusing on new ICT such as internet and mobile phones. It discusses the role of the UK and the wider international community, and the effectiveness of projects funded by international aid.

Current work

POSTnotes are in preparation on:

Biological Sciences and Health - Pandemic flu and Paediatric clinical trials

Environment and Energy - Carbon footprint of electricity generation technologies, Climate change adaptation in the UK and Siting of nuclear power plants

Physical Sciences, IT and Communications - Military uses of space, Electronic waste, Data encryption, Analogue-digital switchover and Pervasive computing

Seminars

In January POST and Ofcom hosted the latest in their joint series of parliamentary seminars – on Mobile Television, with a hand-on demonstration afterwards.

In February, POST hosted a seminar by Dr Larry Parker, Chief Energy Analyst with the US Congressional Research Service, on US policy on new nuclear power plants.

Also in February POST hosted a joint seminar with the British Ecological Society on "CAP Reform: can agri-environment schemes deliver public benefits?"

In April POST collaborated with the House of Lords Science and Technology Committee, the Institute of Actuaries and the Royal Statistical Society in a seminar on "Healthy Life Expectancy", which followed up on some issues raised in the Lords committee's 2005 report on Ageing.

Fellows and interns at POST

Alexandre Bredimas (Cambridge University) joined POST in March to work on Siting of nuclear power stations.

Jonathan Butler (Edinburgh University) joined POST in April as a NERC Fellow to work on a POSTnote on Soil erosion.

International activities

In March the Director attended the first planning meeting in Brussels of the grouping of European parliamentary science and technology offices, including POST, who have formed themselves into the European Technology Assessment Group (ETAG) to provide technology assessment services to the European Parliament.

At the end of March the Director and Dr Chandy Nath attended the 2006 Directors' Meeting of the European Parliamentary Technology Assessment network held at Longyearbyen, Svalbard, Norway. Regrettably, a study mission to the research station at Ny Aalesund, the most northerly in the world, had to be cancelled because of excessively high winds.

Additional information can be obtained from POST, House of Commons, 7 Millbank, London SW1P 3JA (020 7219 2840).

Also available on the internet at http://www.parliament.uk/post/home/htm

Members of either House can obtain free copies of all published material. Others may purchase copies from the Parliamentary Bookshop (020 7219 3890). There is also a subscription service: details from POST.

Debates and Selected Parliamentary Questions & Answers

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

A full digest of all Debates, Questions and Answers on topics of scientific interest from 9th January to 30th March 2006 from both Houses of Parliament appears on pages 42 to 51

Science Policy

Post-doctoral Scientific Careers

Debate in Westminster Hall on Tuesday 10 January

Dr Evan Harris (Oxford West and Abingdon) The people under consideration here today are scientific post-doctoral researchers or post-doctoral students who, having obtained a good first degree which enabled them to obtain funding for and complete a doctorate, have continued in contract research. There are tens of thousands of them and they are some of the brightest people our higher education system has produced, with great future potential. However, they are undervalued and underused and many of them are leaving. Cancer Research UK points out that post-doctoral researchers are a valuable asset to UK research but the lack of job security and career structure is a disincentive for scientists to stay in research. It is acknowledged that the stipend for doctorates has increased, with three year research contracts currently in the £20 to £30k range, up to five years after obtaining a doctorate. However, this is insufficient to enable independent living, due in part to the ongoing debts attributable to the first degree at university, and this level and manner of funding does not lead into a formal career structure comparable with full time employment elsewhere. Science funding for research is increasingly of this type, with researchers spending many years on short-term contracts. One way forward would be to offer open-ended contracts to those unable to assume lectureships. However, the present unattractive career structure, including short-term contracts and low levels of responsibility, are deterring postgraduates from pursuing a career in science.

The Parliamentary Under-Secretary of State for Trade and Industry (Barry Gardiner) emphasised that this is an important topic for the Government if we are to realise both UK and European targets that depend on an adequate supply of well trained scientists. The contentious issue of the legacy of debt has been lightened somewhat. The "SET for Success" review highlighted the issues that impact on the recruitment and retention of research staff and have provided £185 million of new money up until 2007-08 to introduce the Roberts measures from which PhD students also benefit. Various complicated funding support schemes and changes to regulations designed to broaden the scope and training for research scientists and improve their finances and career path in Research Councils and Universities were discussed.

Terminator Seed Technology

Debate in House of Commons on Wednesday 8 March

Mr Anthony Steen (Totnes) I want to discuss the Government's position on continuing the moratorium on the commercial use and field-testing of terminator seed technology. The moratorium was agreed in 2000 and there is concern that it will be overturned. If it is amended to permit case-by-case assessment, its very purpose will be in jeopardy. Terminator technology, or varietal genetic use restriction technologies known as V-GURTs, produces seeds that grow into plants that have sterile seeds, often known as "suicide seeds". The plant itself appears normal, as do the seeds, but if planted they would never germinate. The technology is designed to ensure that new seeds are purchased annually thus increasing profits for seed manufacturers. Monsanto have decided not to use terminator technology, but it is Governments' responsibility, not the companies', to determine the appropriate use of innovative and controversial technology. Terminator technology should not be ruled out for ever, but there is insufficient evidence on how the technology would operate in practice. The precautionary approach is recommended to this new and quite frightening technology.

The Parliamentary Under-Secretary of State for Environment, Food and Rural Affairs (Mr. Ben Bradshaw) Terminator seed technology is still at the concept stage. The Government are not aware of any commercial activity anywhere in the world based on this technology which presents both risks and potential benefits. No country can be forced to accept terminator seeds. All countries that are signatories to the Cartagena protocol on biosafety under the UN convention on biological diversity can make their own decisions about whether to authorise a genetically modified organism for import. The Government recognise the importance of constantly expanding our understanding of GMOs. A study has been commissioned to review the various technologies that might be used to achieve biological containment of GM or non-GM crops. The study will review the development of GURTs and will be published later this year. The Government will continue to adopt a precautionary approach to GM crop developments, including any related to terminator seeds and gene use restriction technologies in general, to protect human health and the environment.

Risk Assessment

Question and Written Answer on Thursday 9 March

Dr Gibson (Norwich N): To ask the Secretary of State for Environment, Food and Rural Affairs if the Government will take steps to create a tool to allow advisory committees to deal consistently with risk assessment.

Mr Bradshaw: We are fully in support of the development of more systematic tools to enable better risk assessment. We are encouraging academia to come forward with innovative ideas for dealing with risk and uncertainty as instanced by a recent call, supported by DEFRA by the Engineering and Physical Sciences Research Council for research proposals[1]. These new tools will take some time to develop and we have to note the caution expressed by the Treasury that risk assessment methodologies can be highly specialised and specific to the nature of the risk[2]. Thus advisory committees have to work with the risk assessment methodologies that pertain to their particular risk portfolios which may not be tractable to any single systematic tool.

[1] Scientific Uncertainty and Decision Making for Regulatory and Risk Assessment Purposes Sandpit on January 2006, Shrigley Hall, Pott Shrigley, nr Macclesfield "The assessment and decision making processes within environmental, health, food and engineering sectors pose numerous challenges. Uncertainty is a fundamental characteristic of these problems. How do we account for all the uncertainties in the complex models and analyses that inform decision makers? How can those uncertainties be communicated simply but qualitatively to decision makers? How should decision makers use those uncertainties when combining the scientific evidence with more socio-economic considerations? And how can decisions be communicated so that the proper acknowledgement of uncertainty is transparent?"

[2] http://www.hm-treasury.gov.uk/media/3E3/EE/managingrisks_ appraisal220705.pdf

CyberStorm

Question and Written Answer on Monday 20 March

Lord Harris of Haringey asked Her Majesty's Government: What discussions have taken place with the United States Government about the CyberStorm exercise led by the Department of Homeland Security earlier this year; and what plans they have to conduct a similar exercise in the United Kingdom.

The Minister of State, Home Office (Baroness Scotland of Asthal): The UK Government participated in exercise CyberStorm and was represented by the National Infrastructure Security Co-ordination Centre (NISCC), the MoD, and law enforcement – because cyber-threats are global issues which stretch beyond physical borders.

The NISCC, which is responsible for minimising the risk of electronic attack to the critical national infrastructure (CNI), was involved in the planning process and contributed players to the live exercise. UK aims were all achieved and included testing UK/US communication links and gaining a better understanding of how our US partners would engage with us in managing a crisis of this nature.

The NISCC undertakes major exercises on a regular basis, involving both private-sector companies and other government departments which make up the CNI. The overall aim of these exercises is to improve the resilience of the UK CNI.

Health

Pandemic Influenza

Debate in House of Lords on Friday 20 January

Lord Broers rose to move, That this House takes note of the report of the Science and Technology Committee on Pandemic Influenza. There have been regular influenza pandemics in the past – about three a century and future pandemics are inevitable. Since 2003 a virulent strain of avian flu in south-east Asia , H5N1, has passed from birds to more than 100 people, killing about half of those infected – 79, according to the World Health Organisation (WHO). H5N1 cannot pass efficiently from person to person and may never acquire the ability to do so and hence fail to trigger a human pandemic. It does pass from birds to humans and this brings the world closer to a pandemic than at any time since the 1960s. However, it is not too late for international action to reduce the likelihood that H5N1 turns from a disease of birds into a human pandemic, which is the central theme of the report. Examples were provided of several actions designed to achieve this end. These included pledges from the international community for $1.9 billion, which is not a lot of money compared with the $800 billion for the cost of a pandemic. Rapid identification of outbreaks followed by isolation and saturation with antiviral drugs could prevent a global pandemic and WHO would require more international and UK support for healthcare to facilitate rapid diagnosis and treatment before the virus spreads.

The Government's contingency plan is one of the best, although there are outstanding concerns, detailed in the report, about the lack of clear policy on the question of antiviral drugs, where 14.6 million courses of Tamiflu have been ordered. The health services also need clear guidance right now, as up to ten per cent of the population could require the services of a GP on a weekly basis. There is no point in waiting. Barriers to effective surveillance must be lifted so profoundly important long-term research can also be undertaken without awaiting outcomes on funding and ethical committee applications. Someone needs to get a grip on these and other relevant issues to ensure that all elements of society develop plans for responding to a pandemic.

Lord Warner responded that the Secretary of State for Health has been designated as the lead Minister for pandemic flu, and the Cabinet Committee on Influenza Pandemic Planning has been created to co-ordinate cross-government work. He welcomed the committee's report and its recognition that the UK is among the best-prepared countries in the world, but he reassured noble Lords that the whole issue would be carefully tracked and contingency plans kept up to date, nationally, regionally and locally.

Counterfeit Medicines

Debate in House of Commons on Thursday 26 January

Mr Charles Walker (Broxbourne) The counterfeiting of drugs is a global problem. The WHO estimates that between 8% and 10% of the global supply is counterfeit and between 25% and 40% of medicines in developing countries are fake. Counterfeiting hotspots include Mexico, Pakistan, India, China and Russia. Counterfeits are dangerous for a variety of reasons. They may be contaminated, contain too much or too little or none of the active ingredient. Counterfeits are totally different from generics which must have the same bio-equivalence as the original patented drugs. Counterfeits are fakes which are often lethal.

In 2003 nearly 1000 drug counterfeiting factories were closed in China. It is estimated that 100,000 Chinese people died that year as a result of taking counterfeit medicines. In Africa half of malaria medicines are thought to be fakes. In the West it is almost impossible to distinguish between real and counterfeit medicines which tend to be new and expensive lifestyle drugs. It is estimated that half of the Viagra sold over the internet is worthless. Profits from pharmaceutical counterfeiting are huge, and the risks lower than trafficking narcotics. Counterfeiting is linked to all forms of organised crime and distribution channels mirror those of the illegal drugs trade. Corruption is rife, with retroviral drugs sent to Africa at reduced prices being intercepted by corrupt officials or gangs, and sold back to Europe, to be replaced by worthless copies in Africa.

The UK supply chain remains one of the most difficult to penetrate with 600 million prescriptions written annually. However, in July last year the Medicines and Healthcare products Regulatory Agency (MHRA) identified two licensed wholesalers dealing in counterfeit Lipitor, a powerful cholesterol-busting drug. 50% of the recalled drugs proved to be fakes. It is relatively easy for UK wholesalers to obtain a licence from the MHRA which enables wholesalers to trade almost without restriction. This is compounded by unregulated growth of internet pharmacy.

We need to accept that counterfeiting is a growing global problem fuelled by organised crime, unrestricted parallel trading and the growth of internet dispensing, requiring the Government to take a good look at the regulatory system to protect the public.

The Minister of State, Department of Health (Jane Kennedy) The Government take a great interest in this matter. 10% of medicines worldwide may be counterfeit. The MHRA has developed an anti-counterfeiting strategy and will introduce further safeguards to check the bona fides of named individuals on wholesalers' licences. There is little evidence that the repackaging processes of parallel trade have been the route for introducing counterfeit medicines into the legitimate supply chain in the UK. Bona fide internet pharmacies must operate from premises registered through the Royal Pharmaceutical Society of Great Britain, and consumers are advised to consult their online register before purchasing via the internet. It is currently investigating 103 cases involving internet sales and has prosecuted 12 cases since 2000. The MHRA is leading a Europe-wide Tamiflu counterfeit surveillance project.

Energy

Nuclear Power

Debate in House of Lords on Thursday 16 February

Lord Jenkin of Roding rose to call attention to the role of nuclear power in energy policy in the light of the consultative document, Our Energy Challenge; and to move for Papers. For the first time in history the UK is becoming a net importer of energy with oil and gas reserves falling faster than forecast. Demand from China and India is pushing up prices and forcing industry to cut back. The Russian readiness to cut gas supplies to Ukraine and Georgia is a foretaste of the future. The assumption in the 2003 White Paper of future dependence for up to 80% of the UK's gas requirements from imports looks dangerously unwise. Meanwhile, the essential liberalisation of continental energy markets is at a standstill in spite of overoptimistic EU reports. Mr Alan Johnson, the Secretary of State, was starkly warned by his officials last year that ambitious energy saving targets in the White Paper would not be met. In spite of wind power investment, the 2010 and 2020 targets for renewables are unlikely to be met, with annual increases of carbon dioxide over the last three years. The three year old White Paper model is seriously flawed. Hence the Nuclear Option, which formed part of the White Paper – which Ministers recently asserted would not be needed – is now back on the agenda. An environmentalist recently claimed that the review is a camouflage for a decision that has already been made, to go nuclear.

I hope this is untrue as there must be more to this review than just new nuclear build. The role of the Government must be to set a clear framework within which the market can assess the risks and finance the investment over the longer term. However, despite Ofgem's protestations, the regulatory regime is essentially short term as Lord Tombs has warned the House on many occasions. The main engineering institutions pointed out that investment in nuclear power is very sensitive to policy uncertainty which is a major deterrent to private investment. Nuclear power has one of the smallest environmental footprints of any source of electricity or any manufacturing processes according to Lord Sainsbury. It is absurd therefore that nuclear power has to pay the climate change levy as it has the lowest carbon footprint and is a benign source of power. However, as 63 per cent of people now believe that reliability of electricity supply should be ensured through a mix of nuclear and renewable resources, and as BNFL is selling Westinghouse to Toshiba, we will now need to buy foreign-owned technology for any new nuclear programme. Government decisions are also now urgently required on nuclear fuel manufacture, nuclear waste disposal and adequate staffing for the Nuclear Industries Inspectorate.

Lord Cunningham of Felling claimed that the UK has been safely generating reliable daily outputs of nuclear power for 50 years, some 2 million million kilowatt hours with a negligible discharge of carbon dioxide which has avoided the emission of 1.6 billion metric tonnes of carbon dioxide over the same period from fossil fuels which otherwise would have been burnt. Nuclear power is an essential component of energy policy if sustainable development is the goal.

Lord Flowers pointed out that the regrettable absence of a long-term nuclear waste strategy in this country should not prevent the Government and the nuclear industry revealing and getting their plans for nuclear power development approved and agreed. A strategy for disposal of nuclear waste should coincide with an announcement on new nuclear build and be agreed and promulgated within the next 10 years.

Lord Tombs urged the Government to abandon anti-nuclear measures such as imposition of a CO_2 tax on a non-CO_2 producing industry, punitive local rates on nuclear generation, exclusion of nuclear generation from the national fossil fuel obligation and the oppressive financial terms imposed on British Energy by a Government "rescue" of the company from a crisis purely of the Government's making. The reality is that nuclear power as a baseload contributor to our energy demand can allow us to build a less polluting society and at the same time preserve our strategic and economic independence in the energy field. It also offers through hydrogen production the best hope available of tackling that mammoth polluter, transport.

Baroness Miller of Hendon stated that the Government are confessing that the assumptions on which they have based their entire energy policy, as contained in the White Paper, were disastrously wrong, and are one day going to make us a hostage to fortune. Nuclear power has many advantages for the United Kingdom, which, in a generation, will be reduced to the same state as Japan of having no indigenous fuel supplies of its own. The Bishop of Southwell is not correct in suggesting that high-grade uranium ore will soon be exhausted when currently available supplies will certainly outlast proven reserves of oil and gas. The decommissioning costs are exaggerated as new build should wherever possible be on existing sites thus avoiding NIMBY objections as people in those areas are happy to have them as they provide jobs. The Government have got totally wrong all those assumptions on which current energy policy was based. If the Government have not finished with keeping the nuclear option open, what do they propose to do?

Lord Davies of Oldham responded that it is absolutely not the case that the White Paper of 2003 has been destroyed by recent developments. He thanked all speakers for their contributions and did not wish to minimise the challenge that is before the Government on energy policy and emphasised that the policy is on very sound foundations at present.

Renewable Energy

Debate in Westminster Hall on Tuesday 28 March

Ian Lucas (Wrexham) The Chancellor's announcement of an additional £50 million in investment for microgeneration in the Budget has been widely welcomed, even by Greenpeace. Sharp is one of the few UK plants manufacturing photovoltaic solar cells based in Wrexham, and North Wales is developing a reputation as a renewable energy hub with opportunities for increased manufacturing based on renewable energy and microgeneration. However, most of the production is exported to Germany where as many people will shortly be involved in solar energy as in coal mining. Solar energy and microgeneration are therefore big business. However, the domestic market has been slow to develop in comparison with Germany, Spain and the Netherlands.

The Government must therefore play a central role in designing the new low-carbon buildings programme and simplifying the process of securing benefits of grants for consumers. The application forms are seriously intimidating to someone who is keen to invest in microgeneration. A straightforward system for individuals would be much more effective so that they could ensure that they had easy access to microgeneration.

The Minster for Energy (Malcolm Wicks) The low-carbon buildings programme starts at the beginning of April 2006. It is based on the recommendation of a review that the installation of photovoltaics and other small-scale renewables should be supported and takes a holistic approach to the reduction of carbon emissions by using innovative combinations of microgeneration technologies and energy efficiency measures. Individual installations will be supported although emphasis will shift to large-scale developments including new build and refurbishments. The DTI will work with the Carbon Trust to construct standard low-carbon buildings that can be easily replicated.

Other areas that the microgeneration strategy will address include the physical infrastructure concerning the connection to the distribution network and smart metering that will enable people to see the contribution that microgeneration is making to their electricity supply. We also want more of our children to work in schools where teachers can demonstrate how renewable technologies are working as it will help with their general education about the planet and create more potential customers for renewables in their own homes.

UK Parliament - Digest of Parliamentary Debates, Questions and Answers 9th January – 30th March 2006

The references are to Hansard, giving first the date of publication, either HoC (House of Commons) or HoL (House of Lords), and finally the column number in Hansard.

**Denotes selected Debates and Questions and Answers of particular interest which are reproduced on pages 38 to 42.*

Agriculture

Agriculture – 15.3.06 HoL WA225
Biofuels – 2.2.06 HoC 448
Rural Economy – debate – 2.2.06 HoL 305
Seed Imports – 9.2.06 HoC 1359W

Animal Experiments

Animal Procedures – 6.3.06 HoC 1131W
Testing – 19.1.06 HoC 1521W
Animals (Scientific Procedures) – 9.1.06 HoC 346W
Act 1986 – 6.3.06 HoC 52WS & HoL WS47
Animals in Research – 17.3.06 HoC 2596W
LD50 Test – 9.1.06 HoC 375W
Medicines: Animal Testing – 13.3.06 HoL WA191
Shellfish Toxins (Use of Animals) – 17.1.06 HoC 1282W & 8.3.06 HoC 1603W

Animal Health and Welfare

African Nations (Avian Flu) – 31.1.06 HoC 331W
Agriculture: Sheep – 15.3.06 HoL WA227
Animal Health – 2.3.06 HoL WA88
Welfare – 6.2.06 HoC 879W
Welfare Bill – 30.1.06 HoC 1W
Apiculture – 11.1.06 HoC 623W
Avian Influenza – 10.1.06 HoC 441W, 16.1.06 HoC 892W, 17.1.06 HoL WA97, 18.1.06 HoC 1337W, 24.1.06 HoC 1946W, 25.1.06 HoC 2107W, 31.1.06 HoC 298W & 321W, 2.2.06 HoC 454, 6.2.06 HoC 879W, 13.2.06 HoC 1538W, 14.2.06 HoC 1807W, 16.2.06 HoC 2273W, 27.2.06 HoC 261W, 3.3.06 HoC 1008W, 6.3.06 HoC 1070W, 7.3.06 HoC 1322W, 9.3.06 HoC 932 & 942, 14.3.06 HoC 2076W, 16.3.06 HoC 2487W, 17.3.06 HoC 2505W, 20.3.06 HoC 3W, 21.3.06 HoC 184W, 22.3.06 HoC 436W & 23.3.06 HoC 483W
Avian Quarantine – 11.1.06 HoL WA54 & 16.1.06 HoC 895W
Biosecurity – 14.3.06 HoC 2078W
Bird Imports – 10.1.06 HoC 443W
Keepers – 2.2.06 HoC 626W
Chicken Farming – 1.2.06 HoC 495W

Aviation

Biological and Chemical Weapons

Biodiversity and Conservation

Biotechnology

Bovine Tuberculosis

Chemicals and Pesticides

Climate Change

Construction

Crime

Defence

Defence (Gulf War)

Education

Energy

Energy (Nuclear)

Energy (Renewable)

Engineering

Environment (Pollution)

Environment (Protection)

EU Meetings

Fisheries

Food and Nutrition

Aspartame – 19.1.06 HoC 1521W, 1.2.06 HoC 610W & 1.3.06 HoC 754W
Benzene – 14.3.06 HoC 2185W
    Contamination – 16.3.06 HoC 2474W
Breastfeeding – 19.1.06 HoC 1522W
Calcium (Children) – 20.1.06 HoC 1658W
Chicken Imports – 30.3.06 HoC 1094W
Children: Healthy Eating – 8.3.06 HoL 750
Eggs – 9.1.06 HoC 122W
Folic Acid – 6.2.06 HoC 974W
Food – 9.2.06 HoL WA118, 9.3.06 HoL WA159 & 21.3.06 HoL WA33
    Agency: Vitamin D – 30.1.06 HoL WA6
    Allergies – 21.3.06 HoC 258W
    Authority – 29.3.06 HoC 1063W
    Labelling – 16.3.06 HoC 2478W, 21.3.06 HoC 259W & 30.3.06 HoC 1173W
    Supplements – 11.1.06 HoC 723W & 16.3.06 HoC 2478W
    Supplements Directive – 12.1.06 HoC 864W & 21.3.06 HoC 260W
Functional Foods – 8.2.06 HoL WA100
Genetically Modified Foods – 24.1.06 HoC 2078W, 25.1.06 HoC 2183W & 9.2.06 HoC 1474W
Genetically Modified Organisms – 27.2.06 HoC 448W
GM Safety Research – 7.2.06 HoC 1176W
High Fat Foods – 22.3.06 HoC 428W
Meat Hygiene Service – 27.3.06 HoC 795W
Nutrient Profiling – 16.3.06 HoC 2482W & 21.3.06 HoC 274W
Nutrition/Health Claims – 1.3.06 HoC 763W
Nutritional Profiling – 27.3.06 HoC 802W
Plastic Water Bottles – 9.1.06 HoC 155W
Poultry Inspection – 6.2.06 HoC 990W
Prisons: Diet and Behaviour – 29.3.06 HoL 772
Processed Food – 9.1.06 HoC 160W & 25.1.06 HoC 2185W
Raw Milk Products – 9.3.06 HoC 1774W
Salt Consumption – 2.3.06 HoC 927W
School Food – 23.3.06 HoC 550W
Schools: Meals – 14.2.06 HoL WA164
Selenium – 30.3.06 HoC 1178W
Soft Drinks (Benzene) – 14.3.06 HoC 2200W
Stilton Cheese – 2.3.06 HoL 343
Sugar – 1.3.06 HoC 770W
Trans Fats – 28.3.06 HoC 970W
Tuna (Mercury Levels) – 1.2.06 HoC 621W
UK Food Security – 6.2.06 HoC 891W
Vitamin D – 11.1.06 HoC 738W
Young Offenders: Diet – 9.2.06 HoL WA124 & 6.3.06 HoL WA118

Health (Cancer)

Bowel Cancer – 26.1.06 HoC 2334W, 16.2.06 HoC 2291W & 13.3.06 HoC 1969W
    Screening Programme – 23.3.06 HoC 578W
Breast Cancer – 10.1.06 HoC 572W, 26.1.06 HoC 2335W, 2.2.06 HoC 735W, 8.2.06 HoC 1305W, 9.2.06 HoC 1471W & HoL 774, 16.2.06 HoC 2293W & 1.3.06 HoC 757W
Cancer – 9.1.06 HoL WA5, 12.1.06 HoC 762W & HoL WA82, 24.1.06 HoC 2045W, 7.3.06 HoC 1296W, 13.3.06 HoC 2012W, 22.3.06 HoC 427W, 28.3.06 HoC 951W, 29.3.06 HoC 1058W & 30.3.06 HoC 1169W
    Treatment – 10.1.06 HoC 572W & 11.1.06 HoC 717W
Cancer: Bowel – 9.2.06 HoL WA115, 13.2.06 HoL 995, 14.3.06 HoL WA205 & 6.3.06 HoL WA250
    Cervical – 23.3.06 HoL WA73
    Herceptin – 1.3.06 HoL WS19
    Prostate – 23.1.06 HoL WA144
Colon Cancer – 15.2.06 HoC 2110W, 16.2.06 HoC 2296W, 15.3.06 HoC 2319W & 17.3.06 HoC 2552W
    Deaths – 1.2.06 HoC 604W
Femara – 19.1.06 HoC 1524W
Herceptin – 9.1.06 HoC 128W, 19.1.06 HoC 1525W, 31.1.06 HoC 459W, 27.2.06 HoC 454W, 1.3.06 HoC 25WS, 2.3.06 HoC 916W, 17.3.06 HoC 2560W & 20.3.06 HoC 160W
Mesothelioma – 20.3.06 HoC 166W
Neuroblastoma – 2.2.06 HoC 723W & 27.2.06 HoC 471W
Prostate Cancer – 12.1.06 HoC 882W, 13.2.06 HoC 1532W, 2.3.06 HoC 927W, 7.3.06 HoC 1251W, 17.3.06 HoC 2563W & 21.3.06 HoC 353W
Rule of Rescue Principle – 13.2.06 HoC 1794W
Tarceva – 13.2.06 HoC 1796W & 2.3.06 HoC 929W
Temozolomide – 23.3.06 HoC 592W

Health (General)

Acinetobacter – 3.3.06 HoC 1035W
Alternative Medicine – 8.3.06 HoC 1606W
Biobank Project – 14.3.06 HoC 2186W
BRCA1 Testing – 17.3.06 HoC 2551W
Chronic Fatigue Syndrome/Myalgic Encephalomyelitis – 29.3.06 HoL WA114
Coeliac Disease – 16.1.06 HoC 1061W
Complementary and Alternative Medicine – 25.1.06 HoC 2182W
Deaf-blind People (Technology Access) – adjournment debate – 28.3.06 HoC 241WH
Dementia – 2.3.06 HoC 905W
Departmental Research – 30.1.06 HoC 162W
Diverticulitis – 31.1.06 HoC 455W
Duchenne Muscular Dystrophy – 6.3.06 HoC 1203W
E.coli 0157 – 14.3.06 HoC 2189W
Fluoridated Water – 2.2.06 HoL WA68
Folic Acid – 30.1.06 HoC 166W
Gene Therapy – 30.1.06 HoC 167W
Genetic Discrimination – adjournment debate – 15.3.06 HoC 447WH
Genetic Testing – 30.1.06 HoC 167W, 8.2.06 HoC 1310W & 13.2.06 HoC 1766W
    Employment and Insurance – 15.3.06 HoL 1213
Genetics – 28.3.06 HoC 960W
Group B Streptococcus Screening – 17.1.06 HoC 1298W
Haemodynamic Fluid Optimisation – 6.2.06 HoC 974W & 17.3.06 HoC 2258W
HIV/AIDS – 27.2.06 HoC 455W
Homeopathy – 23.1.06 HoL 948 & 1.2.06 HoC 612W
Human Fertilisation and Embryology Act 1990 – 29.3.06 HoL WS85
Insurance (Genetic Testing) – 6.3.06 HoC 1101W & 1213W
Kidney Disease – 13.2.06 HoC 1771W
Magnet Therapy – 8.3.06 HoC 1621W
Mal de Debarquement Syndrome – 17.3.06 HoC 2562W
Medical Practitioners: Regulation – 27.2.06 HoL WA24
Mesothelioma Research Group – 14.2.06 HoC 2025W
Multiple Technology Process – 27.2.06 HoC 470W
Munchausen Syndrome by Proxy – 20.1.06 HoC 1673W
Myalgic Encephalomyelitis – 27.3.06 HoC 197W

Health (Infections)

Health (Influenza)

Health (International Development)

Health (Information Technology)

Health (Service)

Health (Vaccines)

Identity Cards

Industry

Information Technology

Intellectual Property Rights

International Development

Medicines and Drugs

Ritalin – 7.3.06 HoL WA124 & 9.3.06 HoL WA173
Selective Seratonin Re-uptake Inhibitors – 22.3.06 HoC 454W
Sorafenib – 16.1.06 HoC 1075W
Statins – 16.2.06 HoC 2322W
Tarceva – 16.2.06 HoC 2322W
Temozolomide – 13.3.06 HoC 2044W, 14.3.06 HoC 2157W & 2200W
TGN 1412 – 27.3.06 HoC 809W
Traditional Herbal Medicinal Products Directive – 27.2.06 HoC 445W & 14.3.06 HoC 2201W
Velcade – 6.2.06 HoC 995W

Nuclear and Radiation Hazards

Coastal Defence (Nuclear Power Plants) – 23.1.06 HoC 1705W
Low Level Radioactive Waste – 28.2.06 HoC 10WS
Nuclear Decommissioning – 17.1.06 HoC 1252W & 17.3.06 HoC 2547W
  Authority – 16.2.06 HoC 2401W, 27.2.06 HoC 134W & 21.3.06 HoC 197W
Nuclear Fuels – 7.2.06 HoC 1073W & 27.2.06 HoC 135W
Nuclear Materials Balance – 7.2.06 HoC 45WS & HoL WS43
Nuclear Power – 9.2.06 HoC 1376W
  Wales – 25.1.06 HoC 2178W
Nuclear Waste – 25.1.06 HoC 2178W, 30.1.06 HoC 8W, 2.2.06 HoC 459 & 624W
Office for Civil Nuclear Security – 29.3.06 HoC 998W
Radioactive Waste – 1.2.06 HoC 552W & 22.3.06 HoC 392W
Spent Nuclear Fuel – 26.1.06 HoC 2353W & 9.2.06 HoC 1363W
THORP – 25.1.06 HoC 2179W & 26.1.06 HoC 2355W

Science Policy

Agriculture: Grassland-based Sustainable Research – 2.3.06 HoL WA85
  Research – 8.3.06 HoL WA129
Biochemical and Biological Research – 3.3.06 HoL WA107
Biotechnology and Biological Sciences Research Council – 20.1.06 HoC 1634W
Centre for Ecology and Hydrology – 10.1.06 HoC 471W, 16.1.06 HoC 896W, 18.1.06 HoL WA107, 24.1.06 HoC 1940W, 30.1.06 HoC 3W, 102W & HoL WA3, 2.2.06 HoC 625W, 6.2.06 HoL WA84, 7.2.06 HoC 1069W, 8.2.06 HoL WA97, 9.2.06 HoC 1349W, 14.2.06 HoC 1860W & HoL WA145, 15.2.06 HoL WA175, 27.2.06 HoC 265W, 1.3.06 HoC 741W, 7.3.06 HoC 1288W, 9.3.06 HoC 1677W, 15.3.06 HoC 2280W & 20.3.06 HoL 9
Civil Service: Specialists – 16.2.06 HoL 1255
Defra: Research Funding – 15.3.06 HoL WA230
Departmental Research – 6.2.06 HoC 886W
  DTI – 30.1.06 HoC 104W
  DEFRA – 23.3.06 HoC 484W
Emerging Technologies – 23.3.06 HoC 405
English Nature – 14.2.06 HoC 1812W & 15.2.06 HoC 2039W
Environmental Research Projects – 24.1.06 HoC 1950W
European Institute of Technology – 22.3.06 HoC 387W
Freshwater Biological Association Library/Kritsch Collection – 22.3.06 HoC 387W & 28.3.06 HoC 841W
Institute of Grassland and Environmental Research – 13.3.06 HoC 1854W
Kent Science Park – 29.3.06 HoC 1018
Laboratory Closure – 1.2.06 HoC 312
Met Office – 31.1.06 HoC 8WS
Monks Wood National Nature Reserve – 15.2.06 HoC 2044W
National Health Research Strategy – 25.1.06 HoC 57WS & HoL WS61
National Institute for Medical Research – 8.3.06 HoC 1513W
National Weights and Measures Laboratory – 1.2.06 HoC 549W
Natural Environment Research Council – 10.1.06 HoC 476W, 20.1.06 HoC 1635W, 23.1.06 HoC 1767W, 1.3.06 HoC 744W, 7.3.06 HoC 1292W, 22.3.06 HoC 390W & 29.3.06 HoC 9989W
Newton's Apple Tree – 7.3.06 HoC 1293W
* Post-doctoral Scientific Careers – adjournment debate – 10.1.06 HoC 66WH
Research and Development – 1.3.06 HoC 750W & 8.3.06 HoC 1511W
  Grants – 16.2.06 HoC 2402W & 27.2.06 HoC 141W
  Strategy – 11.1.06 HoC 632W
Research Station Closures – 13.3.06 HoC 1996W
* Risk Assessment – 9.3.06 HoC 1682W
Risk Management – 24.1.06 HoL WA163
Science Funding – 30.3.06 HoC 1110W
Science Infrastructure – 1.3.06 HoC 746W
Small Business Research Initiative – 19.1.06 HoC 1518W, 16.2.06 HoC 121WS & HoL WS108
Social Scientific Researchers – 27.2.06 HoC 283W
Technology Programme – 10.1.06 HoC 477W

Space

European Space Industry – 23.3.06 HoC 513W
Galileo European Satellite – 13.2.06 HoC 1619W
Galileo Global Positioning System – 1.2.06 HoL WA53
Satellite Licences – 7.3.06 HoC 1294W
Space Debris – 31.1.06 HoC 311W

Telecommunications and Broadcasting

3G Mobile Telephones – 9.2.06 HoC 1467W
Mobile Phone Masts – 8.2.06 HoC 1315W, 27.2.06 HoC 466W & 28.3.06 HoC 924W
Mobile Phone Tracking – 6.2.06 HoC 903W
Telecommunications Masts – 1.3.06 HoC 770W
Telephone Masts (Leicester) – 27.2.06 HoC 142W

Transport

Alstom Rail Test Track – 23.1.06 HoC 1721W
Alternative Fuels – 8.3.06 HoC 1516W
Bioethanol – 15.3.06 HoC 2285W
Biofuels – 24.1.06 HoC 1983W & 9.3.06 HoC 938
British Oil Consumption – 8.3.06 HoC 1513W
Carbon Emissions – 9.1.06 HoC 13W & 28.2.06 HoC 677W
Catalytic Converters – 9.2.06 HoC 1471W
Digital Tachographs – 8.2.06 HoC 1194W
European Biofuels Directive – 27.2.06 HoC 150W
Greener Fuels (Taxation) – adjournment debate – 8.3.06 HoC 279WH
Hydrogen Powered Fuel Cell Buses – 13.2.06 HoC 1497W
Maritime Safety – 8.3.06 HoC 1526W
Motor Vehicles (Air Conditioning Emissions) – 14.2.06 HoC 1876W

Motorway Resurfacing – 16.1.06 HoC 933W
Renewable Energy – 8.3.06 HoC 1528W
Renewable Transport Fuels Obligation – 17.3.06 HoC 2512W
Road Charging – 6.3.06 HoC 1091W
Road Pricing – 14.2.06 HoC 1269 & 8.3.06 HoC 1529W
Schemes – 7.2.06 HoC 1059W
Road Projects – 8.3.06 HoC 1529W
Road Transport Fuel Obligation – 30.1.06 HoC 27W
Roads – 14.2.06 HoC 1881W
Seat Belts – 16.1.06 HoC 941W
Shipping Accidents – 8.3.06 HoC 1530W
Smartcard Technology – 30.3.06 HoC 1125W
Transport Innovation – 13.3.06 HoC 1890W
Fund – 26.1.06 HoC 66WS & HoL WS72
Transport Research – 16.2.06 HoC 2415W
Vegetable Oil – 9.2.06 HoC 1370W
Vehicles: Alternative Fuels – 9.3.06 HoL WA176
Biodiesel – 13.3.06 HoL WA204
Biofuels – 7.3.06 HoL WA126
Personal Digital Cards – 16.2.06 HoL WA209

Waste

Batteries – 30.1.06 HoC 1W
Recycling – 9.3.06 HoC 942
Compost Material – 27.2.06 HoC 267W
Energy from Waste Plants – 7.2.06 HoC 1071W
EU Packaging Directive – 16.1.06 HoC 904W
EU Waste Electrical and Electronic Equipment Directive – 23.1.06 HoC 1763W
European Union Directives – 9.2.06 HoC 1373W
Incineration – 9.2.06 HoC 1355W
Landfill – 15.3.06 HoC 2282W
Non-recyclable Packaging – 27.2.06 HoC 134W
Packaging – 8.2.06 HoC 1288W
Recycling – 25.1.06 HoC 2115W, 8.2.06 HoC 1290W, 27.2.06 HoC 275W, 8.3.06 HoC 1500W & 15.3.06 HoC 2282W
Solid Waste (Thermal Processing) – 31.1.06 HoC 310W
Supermarkets (Packaging) – 8.3.06 HoC 1502W
Tallow – 8.2.06 HoL WA110
Waste and Resources Programme – 23.3.06 HoC 486W
Waste Disposal – 27.3.06 HoC 663W
Electrical and Electronic Equipment Directive – 19.1.06 HoC 1518W
Exports – 10.1.06 HoC 455W
Incineration – 9.3.06 HoC 944
Management – 27.2.06 HoC 283W
Strategy – 22.3.06 HoC 445W

Water

Cancer: Water Fluoridation – 19.1.06 HoL WA127
Desalination – 28.3.06 HoC 839W
EU: Water Framework Directive – 30.3.06 HoL WA144
Fluoridation Schemes – 29.3.06 HoC 1062W
Fluoride – 24.3.06 HoL WA87
Water – 9.3.06 HoC 939 & 28.3.06 HoC 843W
Abstraction (SSSIs) – 7.3.06 HoC 1263W
Conservation – 9.3.06 HoC 1683W
Purification – 8.3.06 HoC 1504W
Supplies – debate – 30.3.06 HoL 862
Supply – 7.3.06 HoC 1264W

Euro-News

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

European Institute of Technology (EIT)

The Commission has unveiled its draft plans for creating a European Institute of Technology, based on a two-tier structure consisting of a central governing board and a network of seconded "knowledge communities" from universities, research centres and companies across Europe. The EIT's mission, according to President Barroso, will be to combine education, research and innovation. It will offer education of the highest international standard; carry out basic and applied research in transdisciplinary areas with a particular industry focus; and build strong links with industry to ensure its work leads to an increase in innovation. "We plan to create a unique European institution unlike any other current or planned EU initiative," said Mr Barroso, emphasising the clear delineation between the roles of the EIT, the framework programmes and the European Research Council. "The EIT will add value to what is already being done in the EU, Member States and universities, and establish a new relationship between education, research and business. It will be a flagship and a symbol for Europe, but more than that it will also do concrete research and produce concrete results".

Agri-Environment Schemes

In 2003 the EU spent an estimated €3.7 billion on so-called agri-environment schemes (AES), and in 2005, approximately 25% of the total agricultural area in the EU-15 countries was covered by an AES. However, following three years of research in Germany, the Netherlands, Spain, Switzerland and the United Kingdom, scientists have concluded that AES in Europe "appears to be largely ineffective as policy instruments".

Chemical Exposure link to Childhood Cancer

Partners from 25 institutions in 16 EU Member States are to investigate how exposure to chemicals in food and the environment during pregnancy is connected with childhood cancer and immune disorders. Childhood cancer has increased during recent decades, as has the worldwide prevalence of childhood immune disorders such as asthma and eczema. Childhood leukaemia in particular has become more prevalent, and, as explained by project co-ordinator Professor Jos Kleinjans from Maastricht University, the Netherlands, the increase must

be attributed to something, either genetic changes or the environment, which is considered the most likely cause.

Creating an innovative Europe

According to Esko Aho, former Finnish Prime Minister and chair of the panel that published the report *Creating an Innovative Europe* on 20 January, the measures needed to boost Europe's competitiveness are well known. The real question is how to secure the necessary commitment to implement them, he believes. The knowledge base in Europe is roughly the same as in the United States, but the main difference is that in Europe the markets simply aren't there for innovative goods and services. Market creation is therefore the most crucial factor to achieving the Lisbon goals. Investment targets for R&D, such as the 3% Barcelona target, should be viewed as indicators of performance rather than goals in themselves. When moving from a resource-based economy to a knowledge-based model, it is vital that resources become mobile so that they can be quickly moved from old areas to new sectors as required. Policy-makers will find some decisions very hard to take, for instance when moving resources away from traditional sectors to new high-growth ones, but that is why it is important to have an overall Pact for Research and Innovation.

Commission promotes biofuel production

"There has never been a better moment to push the case for biofuels" said EU Agriculture and Rural Development Commissioner Mariann Fischer Boel. "Crude oil prices remain high. We face stringent targets under the Kyoto protocol, and the recent controversy over imports of Russian gas has underlined the importance of increasing Europe's energy self-sufficiency. Raw materials for biofuel production also provide a potential new outlet for Europe's farmers, who have been freed by CAP reform to become true entrepreneurs". EU-funded research has already contributed to the growth of the biofuels industry in Europe. The Eurobiodiesel project, for example, demonstrated the technical and economic feasibility of producing and using biodiesel, without significant problems, in tractors, buses and cars.

Sweden aims to eliminate oil

"Our dependency on oil should be broken by 2020" said Minister for Sustainable Development, Mona Sahlin. The move to make Sweden into an oil-free state is led by a consortium of industrialists, academics, farmers, car-makers, civil servants and others. They will issue a report to the Swedish Parliament in a few months. The minister said that Sweden would be putting the following measures into place: tax relief for conversion from oil; more renewable energy; introducing more measures for renewable fuels; more investment in developing a "renewable society"; and continued investment in district (typically geothermal or biomass) heating.

European Union - Digest

The references are to the Official Journal of the European Communities (OJ), Adopted Legislation from the L Series (OJL) and Proposals and Opinions from the C Series (OJC).

Agriculture

Commission Regulations:
181/2006: organic fertilisers and soil improvers – OJL29(p31)2.2.06
217/2006: marketing of seed not satisfying the requirements for minimum germination – OJL38(p17)9.2.06
208/2006 and 209/2006: processing standards for biogas and composting plants – OJL36(p25&p32)8.2.06
Commission Decisions:
2006/10: prohibition of marketing in Greece of MON 810 maize seeds – OJL7(p27)12.1.06
2006/47: placing on the market of a maize product genetically modified for resistance to corn rootworm and certain other pests – OJL26(p17)31.1.06
2006/129: heat treatment for manure – OJL51(p27)22.2.06
2006/197: authorising marketing of food with GM maize 1507 – OJL70(p82)9.3.06

Avian Influenza

Council Directive 2005/94: Community measures for the control of avian influenza – OJL10(p16)14.1.06
Commission Decisions:
2006/11: avian influenza in Croatia – OJL7(p29)12.1.06
2006/23 and 2006/24: avian influenza in Romania – OJL17(p27&30)21.1.06
2006/52: requirements for the surveillance of avian influenza in wild birds – OJL27(p17)1.2.06
2006/86: protection measures in relation to avian influenza in Greece – OJL40(p26)11.2.06
2006/90 and 2006/91: protection measures in relation to avian influenza in Italy and Slovenia (OJL42(p46&52)14.2.06
2006/94: interim protection measures in relation to avian influenza in Austria – OJL44(p25)15.2.06
2006/101: implementation of a survey programme for avian influenza in poultry and wild birds to be carried out in Member States in 2006 – OJL46(p40)16.2.06
2006/115: protection measures in relation to avian influenza in wild birds in the Community – OJL48(p28)18.2.06
2006/147 and 2006/148: preventive vaccination against H5N1 in the Netherlands and France – OJL55(p47&51)25.2.06
2006/175: outbreak of avian influenza in France – OJL62(p27)3.3.06
2006/227: avian influenza in Israel – OJL81(p43)18.3.06
2006/247: imports from Bulgaria in relation to avian influenza – OJL89(p52)28.3.06
2006/251: outbreaks of avian influenza in Member States – OJL91(p33)29.3.06
2006/256: avian influenza in Croatia – OJL92(p15)30.3.06
12006/265: avian influenza in Switzerland – OJL95(p9)4.4.06

Opinion of the European Economic and Social Committee: Avian Influenza – OJC24(p16)31.1.06

Aviation

Commission Regulation 240/2006: basic standards on aviation security – OJL40(p3)11.2.06

Animals and Veterinary Matters

Commission Directive 2006/13: undesirable substances in animal feed – OJL32(p44)4.2.06
Commission Regulations:
249/2006: additives in feedingstuffs – OJL42(p22)14.2.06
252/2006: authorisation of certain additives in feedingstuffs – OJL44(p3)15.2.06
253/2006: tests and eradication measures for TSEs in sheep and goats – OJL44(p9)15.2.06
339/2006: importation of live cattle and animal products – OJL55(p5)25.2.06
492/2006: authorisation of certain additives in feedingstuffs – OJL89(p6)28.3.06
545/2006: feed additive "Monteban" – OJL94(p26)1.4.06
546/2006: national scrapie control programmes – OJL94(p28)1.4.06
Commission Decisions:
2006/48: laboratories authorised to check vaccination against rabies – OJL26(p20)31.1.06
2006/60: model animal health certificate for trade in cattle embryos – OJL31(p24)3.2.06
2006/64: bluetongue in Spain and Portugal – OJL32(p80)4.2.06
2006/168: imports of bovine embryos – OJL57(p19)28.2.06
2006/254: Classical Swine Fever in Germany – OJL91(p61)29.3.06
2006/263: Newcastle Disease in Bulgaria – OJL95(p3)4.4.06
2006/264: Newcastle Disease in Romania – OJL95(p6)4.4.06
Opinion of the Economic and Social Committee: Chickens kept for meat production – OJC28(p25)3.2.06

Climate Change

Opinion of the Committee of the Regions: Winning the Battle against Global Climate Change – OJC81(p26)4.4.06

Chemicals

Judgments of the Court: Hazardous chemicals and pesticides in international trade – OJC48(p2&p3)25.2.06

Defence

Council Regulation 394/2006: exports of dual-use items and technology – OJL74(p1)13.3.06
Council Common Position 2006/242 relating to 2006 Review Conference of Biological and Toxin Weapons Convention – OJL88(p65)25.3.06
Council Joint Action on 2006/243 EU Strategy agains Proliferation of Weapons of Mass Destruction – OJL88(p68)25.3.06

Energy

Council Directive 2005/89: measures to safeguard security of electricity supply – OJL33(p22)4.2.06
Opinions of the Economic and Social Committee:
Energy Sources – OJC28(p5)3.2.06
Renewable Energy Sources – OJC65(p105)17.3.06

Environment

Council Regulation 166/2006: the establishment of a European Pollutant Release and Transfer Register – OJL33(p1)5.2.06
Commission Decision 2006/196: integrated pollution prevention and control – OJL70(p65)9.3.06
Call for proposals: Environmental Protection – OJC80(p12)4.4.06

Education and Training

Council Recommendation 2006/143: further European co-operation in quality assurance in higher education – OJL64(p60)4.3.06
Joint Interim Report of Council and Commission: Education & Training 2010 – OJC79(p1)1.4.06
Calls for Proposals:
Innovative Co-operation, training and information projects – OJC27(p10)3.2.06
Socrates programme – OJC32(p34)8.2.06
Erasmus Programme – OJC38(p7)15.2.06
Higher education reform – OJC43(p5)21.2.06
Socrates Programme – OJC56(p12)8.3.06
E-Learning Programme –OJC75(p20)28.3.06

Fisheries

Council Regulations:
51/2006 fixing for 2006 the fishing opportunities and conditions applicable in Community waters and for Community vessels – OJL16(p1)20.1.06
52/2006 fixing the fishing opportunities and conditions applicable to the Baltic Sea for 2006 – OJL16(p184)20.1.06
388/2006: sustainable exploitation of sole in the Bay of Biscay – OJL65(p1)7.3.06
Commission Regulation 440/2006 prohibiting fishing for northern prawn by vessels flying the flag of Poland – OJL80(p23)17.3.06
Commission Decisions:
2006/191: Regional Advisory Council for the Baltic Sea under the common fisheries policy – OJL66(p50)8.3.06
2006/214: approved zones and farms regarding fish diseases – OJL80(p46)17.3.06
Opinion of the Economic and Social Committee: Joint enterprises in the fisheries sector – OJC65(p46)17.3.06

Food

Commission Directives:
2006/30: maximum residue levels for the benomyl group – OJL75(p7)14.3.06
2006/33: food additives – OJL82(p10)21.3.06
2006/37: food supplements – OJL94(p32)1.4.06
Commission Regulations:
6/2006: maximum residue limits of veterinary medicinal products in foodstuffs – OJL3(p3)6.1.06
178/2006: food and feed products to which maximum levels of pesticide residues apply – OJL27(p3)2.2.06
199/2006: maximum levels for certain contaminants in foodstuffs – OJL32(p34)4.2.06
205/2006: maximum residue limits of veterinary medicinal products in foodstuffs – OJL34(p21)7.2.06
401/2006: methods of sampling and analysis for levels of mycotoxins in foodstuffs – OJL70(p12)9.3.06
433/2006: reference laboratories for monitoring water content in poultrymeat – OJL79(p16)16.3.06
Commission Decisions:
2006/58 and 2006/59: marketing of rye bread with additives as novel food – OJL31(p18&21)3.2.06
2006/68: marketing of foods and ingredients derived from GM maize MON863 as novel foods – OJL34(p26)7.2.06

2006/69: marketing of foods and ingredients derived from GM Roundup Ready maize line GA21 as novel foods – OJL34(p29)7.2.06
2006/252: flavouring substances in food – OJL91(p48)29.3.06
Commission Recommendation 2006/88: reduction of dioxins, furans and PCBs in feedingstuffs and foodstuffs – OJL42(p26)14.2.06

IT, Telecommunications and Broadcasting

Commission Decisions:
2006/98 and 2006/178: High Level Expert Group on Digital Libraries – OJL46(p32)16.2.06 & OJL63(p25)4.3.06
2006/214: the i2010 strategy – OJL80(p74)17.3.06
Call for proposals: eTEN 2006/1 – OJC40(p12)17.2.06

Marine and Maritime

Opinion of the Economic and Social Committee: European Maritime Safety Agency – OJC28(p16)3.2.06

Public Health and Pharmaceuticals

Council Directive 2005/90: restriction on the marketing and use of certain dangerous substances and preparations – OJL33(p28)4.2.06
Commission Directive 2006/17: technical requirements for the donation, procurement and testing of human tissues and cells – OJL38(p40)9.2.06
Commission Regulation 507/2006: marketing of medicinal products for human use – OJL92(p6)30.3.06
Commission Decision 2006/89: adopting the work plan for 2006 for Community action in the field of public health – OJL42(p29)14.2.06
Call for proposals: Community action in the field of Public Health – OJC37(p14)14.2.06

Plants and their Protection Products

Commission Directives:
2006/4: maximum residue levels for carbofuran – OJL23(p69)27.1.06
2006/5: to include warfarin as active substance – OJL12(p17)18.1.06
2006/6: to include toylfluanid as active substance – OJL12(p21)18.1.06
2006/9: maximum residue levels of Kiquat – OJL22(p24)26.1.06
2006/10: to include forchlorfenuron and indoxacarb as active substances – OJL25(p24)28.1.06
2006/14: protective measures against the introduction into the Community of organisms harmful to plants – OJL34(p24)7.2.06
2006/16: to include oxamyl as active substance – OJL36(p37)8.2.06
2006/19: including 1-methylcyclopropene as active substance – OJL44(p15)15.2.06
2006/35: organisms harmful to plants – OJL88(p9)25.3.06
2006/36: plant health risks – OJL88(p13)25.3.06

Science Policy

Council Decision 2006/62 enabling countries covered by the European Neighbourhood Policy, as well as Russia, to benefit from the Technical Assistance and Information Exchange Programme – OJL32(p80)4.2.06
Council Joint Action 2006/184 in support of Biological and Toxin Weapons Convention – OJL65(p51)7.3.06
Commission Decision 2006/77 setting up a High Level Group on Competitiveness, Energy and the Environment – OJL36(p43)8.2.06
Opinions of the Economic and Social Committee:
Seventh Framework Programme – OJC65(p9)17.3.06
Competitiveness and Innovation Framework Programme – OJC65(p22)17.3.06
Role of technology parks in the industrial transformation of the new Member States – OJC65(p51)17.3.06
Calls for proposals:
Enhancement of European industrial potential in the field of security research – OJC34(p31)10.2.06
Integrating and strengthening the European Research Area – OJC38(p9)15.2.06
Structuring the European Research Area – OJC12(p10)18.1.06; OJC35(p16)11.2.06; Addendum OJC52(p22)2.3.06; OJC75(p22)28.3.06
Explanatory notes to the Combined Nomenclature of the European Communities – OJC50(p1)28.2.06

Sustainable Development

Opinion of the Economic and Social Committee: Sustainable Development in agriculture, forestry and fisheries and the challenges of climate change –OJC69(p5)21.3.06
Opinion of the Committee of the Regions: Review of the EU Sustainable Development Strategy – OJC81(p28)4.4.06

Toy Safety

Commission communication on safety of toys – OJC56(p3)8.3.06

Transport

Commission Directives:
2006/20: fuel tanks and rear underrun protection of motor vehicles and trailers – OJL48(p16)18.2.06
2006/26: wheeled agricultural or forestry tractors – OJL65(p22)7.3.06
Commission Directive 2006/27 on requirements for two- or three-wheel motor vehicles – OJL66(p7)8.3.06
2006/28: type approval of motor vehicles and trailers – OJL65(p27)7.3.06
Commission Regulation 62/2006: technical specification for interoperability for the freight subsystem on the trans-European rail system – OJL13(p1)18.1.06
Commission Decision 2006/66: technical specification for interoperability for rolling stock on the trans-European rail system – OJL37(p1)8.2.06

Water

Council Directives:
2006/7: bathing water quality – OJL64(p37)4.3.06
2006/11: pollution caused by dangerous substances discharged into the aquatic environment – OJL64(p52)4.3.06

Science Directory

DIRECTORY INDEX

Institution of Civil Engineers
Royal Academy of Engineering
SCI

Information Services
AIRTO
CABI Bioscience

IT, Internet, Telecommunications, Computing and Electronics
CCLRC
University of East Anglia
Engineering and Physical Sciences Research Council
University of Leeds
University of Newcastle upon Tyne
University of Surrey

Intellectual Property
ABPI
The Chartered Institute of Patent Agents
NESTA
University of Newcastle upon Tyne

Large-Scale Research Facilities
Campden & Chorleywood Food Research Association
CCLRC
London Metropolitan Polymer Centre
PPARC

Lasers
CCLRC

Management
University of Leeds

Manufacturing
ABPI
AMSI
Engineering and Physical Sciences Research Council
University of Leeds
London Metropolitan Polymer Centre
SCI

Materials
CCLRC
University of Leeds
London Metropolitan Polymer Centre
National Physical Laboratory

Mathematics
Institute of Mathematics and its Applications
University of Leeds

Medical and Biomedical Research
ABPI
Academy of Medical Sciences
British Pharmacological Society
British Society for Antimicrobial Chemotherapy
University of East Anglia
HFEA
University of Leeds
Medical Research Council
University of Newcastle upon Tyne
University of Surrey
UFAW

Motor Vehicles
University of Leeds
London Metropolitan Polymer Centre
SEMTA

Oceanography
AMSI
Cefas
Natural Environment Research Council

Oil
Institution of Chemical Engineers
LGC

Particle Physics
CCLRC
University of Leeds
PPARC

Patents
The Chartered Institute of Patent Agents
NESTA

Pharmaceuticals
ABPI
British Pharmacological Society
British Society for Antimicrobial Chemotherapy
University of East Anglia
Institution of Chemical Engineers
LGC
Merck Sharp & Dohme
Royal Society of Chemistry
SCI

Physical Sciences
Cavendish Laboratory
Engineering and Physical Sciences Research Council
London Metropolitan Polymer Centre
National Physical Laboratory
PPARC

Physics
Cavendish Laboratory
Institute of Physics
University of Leeds
National Physical Laboratory
PPARC

Physiology
University of Leeds

Pollution and Waste
ABPI
AMSI
CABI Bioscience
Cefas
University of East Anglia
Environment Agency
Institution of Chemical Engineers
Institution of Civil Engineers
London Metropolitan Polymer Centre
Natural Environment Research Council
University of Newcastle upon Tyne

Psychology
British Psychological Society
University of Leeds

Public Policy
British Society for Antimicrobial Chemotherapy
Economic and Social Research Council
HFEA
NESTA
Prospect

Public Understanding of Science
Academy of Medical Sciences
British Association for the Advancement of Science
British Society for Antimicrobial Chemotherapy
Clifton Scientific Trust
University of East Anglia
Engineering and Physical Sciences Research Council
HFEA
Institute of Biology
Institute of Physics
Institution of Chemical Engineers
Medical Research Council
NESTA
Prospect
Royal Academy of Engineering
Royal Institution
The Royal Society
Royal Society of Chemistry

Quality Management
Campden & Chorleywood Food Research Association
LGC

Radiation Hazards
Cefas
HPA Radiation Protection Division

Retail
Marks and Spencer

Satellite Engineering
University of Surrey

Science Policy
ABPI
Academy of Medical Sciences
British Association for the Advancement of Science
British Pharmacological Society
Cefas
Clifton Scientific Trust
Economic and Social Research Council
Engineering and Physical Sciences Research Council
HFEA
Institute of Physics
Institution of Chemical Engineers
LGC
Medical Research Council
NESTA
The Nutrition Society
Prospect
Royal Academy of Engineering
Royal Institution
The Royal Society
Royal Society of Chemistry
The Science Council
UFAW

Seed Protection
CABI Bioscience

Sensors and Transducers
AMSI
CCLRC

SSSIs
English Nature
Royal Botanic Gardens Kew

Statistics
Royal Statistical Society

Surface Science
CCLRC

Sustainability
British Ecological Society
CABI Bioscience
Cefas
University of East Anglia
English Nature
Environment Agency
Institution of Chemical Engineers
Institution of Civil Engineers
London Metropolitan Polymer Centre
University of Newcastle upon Tyne
SCI

Technology Transfer
CABI Bioscience
Campden & Chorleywood Food Research Association
CCLRC
LGC
University of Leeds
London Metropolitan Polymer Centre
NESTA
National Physical Laboratory

Tropical Medicine
Society for General Microbiology

Viruses
ABPI
Society for General Microbiology

Water
AMSI
Campden & Chorleywood Food Research Association
Cefas
University of East Anglia
Environment Agency
Freshwater Biological Association
Institution of Chemical Engineers
Institution of Civil Engineers
LGC
Royal Society of Chemistry
SCI
Society for General Microbiology

Wildlife
British Ecological Society
University of East Anglia
English Nature
Institute of Biology
UFAW

Association of the British Pharmaceutical Industry

Contact: Dr Philip Wright
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;
- avoids unfair commercial returns

Association of Marine Scientific Industries

Contact: John Southerden, Director
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

AMSI is a constituent association of the Society of Maritime Industries; the other associations are:
Association of British Offshore Industries (ABOI)
British Marine Equipment Association (BMEA)
British Naval Equipment Association (BNE**A)**
Ports and Terminals Group (PTG)

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 as quickly as possible into healthcare benefits for society. The Academy's eight hundred Fellows are the United Kingdom's leading medical scientists 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 : Association of Independent Research & Technology Organisations
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 £2 billion. Work carried out by members includes research, consultancy, training and global information monitoring. AIRTO promotes their work by building closer links between members and industry, academia, UK government agencies and the European Union.

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: Public.Affairs@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 Science Budget of the Office of Science and Technology. 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.

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 is the UK's nationwide, open membership organisation dedicated to connecting people with science, so that science and its applications become accessible to all. 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 organises major initiatives across the UK, including the annual BA Festival of Science, National Science Week, programmes of regional and local events, and an extensive programme for young people in schools and colleges.

British Ecological Society

Contact: Nick Dusic, Science Policy Manager
British Ecological Society
26 Blades Court, Deodar Road, Putney, London, SW15 2NU
Tel: 020 8871 9797 Fax : 020 8871 9779
E-mail: nick@BritishEcologicalSociety.org
Website: www.BritishEcologicalSociety.org

The British Ecological Society promotes the science of ecology worldwide. The Society has 4,000 members who are active in advancing the science and application of ecology.
The BES publishes four internationally renowned scientific journals and organises the largest scientific meeting for ecologists in Europe. The BES also supports ecologists in developing countries and fieldwork in schools through its grants.
The BES informs and advises Parliament and Government on ecological issues and welcomes requests for assistance from parliamentarians.

BRITISH PHARMACOLOGICAL SOCIETY

Today's science, tomorrow's medicines

Contact: Sarah-Jane Stagg
British Pharmacological Society
16 Angel Gate, City Road
London EC1V 2SG
Tel: 020 7417 0113
Fax: 020 7417 0114
Email: sjs@bps.ac.uk
Website: www.bps.ac.uk

The British Pharmacological Society has now been supporting pharmacology and pharmacologists for 75 years. Our 2,400 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
33 John Street
London WC1N 2AT
Tel: 020 7692 3412
Fax: 020 7419 6922
Email: anapad@bps.org.uk
Website: www.bps.org.uk

The British Psychological Society is an organisation of over 34,000 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.

British Veterinary Association

BVA

Contact:Chrissie Nicholls
7 Mansfield Street, London W1G 9NQ
Tel: 020 7636 6541
Fax: 020 7637 4769
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, particulary 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

www.cabi.org

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

CABI brings together and applies scientific information and expertise to improve people's lives. Founded in 1910, CABI is owned by over 40 member countries. Today CABI publishes books, journals and scientific outputs, carries out scientific research and consultancies to find sustainable solutions to agricultural and environmental issues and develops innovative ways to communicate science to many different audiences. Activities range from assisting national policy makers, informing worldwide research, to supporting farmers in the field.

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

A 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@phy.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: LEP, SPS & future 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.

Cefas

Centre for Environment, Fisheries & Aquaculture Science

Contact: Anne McClarnon, Communications Manager
Pakefield Road, Lowestoft, Suffolk NR33 0HT
Tel: 01502 56 2244
Fax: 01502 51 3865
E-mail: anne.mcclarnon@cefas.co.uk
Website: www.cefas.co.uk

Cefas offers multidisciplinary scientific research and consultancy for fisheries management and aquaculture, plus environmental monitoring and assessments. Government at all levels, international institutions (EU, UN, World Bank) and clients worldwide have used Cefas services for over 100 years. Three laboratories with the latest facilities, plus Cefas' own ocean-going research vessel, underpin the delivery of high-quality science and advice to policy-makers.

Chartered Institute of Patent Agents

Contact: Michael Ralph -
Secretary & Registrar
The Chartered Institute of Patent Agents
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 agents 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

Council for the Central Laboratory of the Research Councils

CCLRC

Contact: Natalie Bealing
CCLRC Rutherford Appleton Laboratory
Chilton, Oxfordshire, OX11 0QX
CCLRC Daresbury Laboratory
Daresbury, Cheshire, WA4 4AD
Tel: 01235 445484 Fax: 01235 446665
E-mail: enquiries@cclrc.ac.uk
Website: www.cclrc.ac.uk

The CCLRC is the UK's strategic agency for scientific research facilities. It also supports leading-edge science and technology by providing world-class, large-scale experimental facilities. These advanced technological capabilities, backed by a pool of expertise and skills across a broad range of disciplines, are exploited by more than 600 government, academic, industrial and other research organisations around the world each year. The annual budget of the CCLRC is c. £150 million.

University of East Anglia

Contact: Science Communication Officer
University of East Anglia
Norwich NR4 7TJ

Tel: 01603 593007
Fax: 01603 259883
E-mail: press@uea.ac.uk
Website: www.uea.ac.uk

From award-winning technology translating speech into sign language, to internationally-renowned climate research, and from the intricacies of diseases such as cancer to the large-scale hazards of earthquakes and volcanoes, UEA scientists are carrying out world-class research and teaching. A strongly interdisciplinary science cluster: Biological Sciences, Chemical Sciences and Pharmacy, Environmental Sciences, Computing Sciences and Mathematics.

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 contrbuting 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: Lucy Brady,
Head of Marketing and Communications,
EPSRC, Polaris House,
North Star Avenue, Swindon SN2 1ET
Tel: 01793 444147 Fax: 01793 444005
E-mail: lucy.brady@epsrc.ac.uk
Website:www.epsrc.ac.uk

EPSRC invests more than £500 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.

English Nature

Contact: Dr Keith Duff,
Chief Scientist
English Nature
Northminster House, Peterborough,
PE1 1UA
Tel: 01733-455208
Fax: 01733-568834
E-mail: keith.duff@english-nature.org.uk
Website address: www.english-nature.org.uk

English Nature is the Government's wildlife agency working throughout England. With our partners and others we promote the conservation of wildlife and natural places.

We commission research and publish scientific papers which underpin the development of policies and programmes to maintain and enhance biodiversity

Environment Agency

Contact: Steve Killeen,
Head of Science, Environment Agency,
Block 1 Government Buildings
Burghill Road, Westbury on Trym,
Bristol BS10 6BF.
Tel: 0117 914 2980
Fax: 0117 914 2929
E-mail: steve.killeen@environment-agency.gov.uk
Website: www.environment-agency.gov.uk

The Environment Agency is responsible for protecting and enhancing the environment in England and Wales. We contribute to sustainable development through the integrated management of air, land and water. We commission research to support our functions through our Science Programme that is based on a 5 year plan developed through consultation.

Freshwater Biological Association

Contact: Dr Roger Sweeting,
Chief Executive.
The Freshwater Biological Association, The Ferry House, Far Sawrey, Ambleside,
Cumbria LA22 0LP.
Tel: 015394 42468 Fax: 015394 46914
E-mail: info@fba.org.uk
Website: www.fba.org.uk

The Freshwater Biological Association is an independent organisation and a registered Charity, founded in 1929. It aims to promote freshwater science through an innovative research programme, an active membership organisation and by providing sound independent opinion. It publishes a variety of specialist volumes and houses one of the finest freshwater libraries in the world.

Health Protection Agency

Contact: Professor Pat Troop, 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 with the new millennium 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.

The Institute of Mathematics and its Applications

Contact: Lynn Webster, Personal Assistant to Executive Director
Institute of Mathematics and its Applications
Catherine Richards House, 16 Nelson Street
Southend-on-Sea, Essex SS1 1EF
Tel: 01702 354020
Fax: 01702 354111
E-mail: post@ima.org.uk
Website: www.ima.org.uk

The IMA is a professional and learned society for qualified and practising mathematicians. Its mission is to promote mathematics in industry, business, the public sector, education and research.
Forty percent of members are employed in education (schools through to universities), and the other 60% work in commercial and governmental organisations.
The Institute is incorporated by Royal Charter and has the right to award Chartered Mathematician status.

Institute *of* Physics

Contact: Public Relations Department
76 Portland Place, London W1B 1NT
Tel: 020 7470 4800
E-mail: public.relations@iop.org
Websites: www.iop.org
www.einsteinyear.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 25,000 members.

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

Institution of Civil Engineers

ice

Contact: Neal Weston,
External Relations Manager
One Great George Street, Westminster,
London SW1P 3AA, UK
Tel: 020 7665 2151
Fax: 020 7222 0973
E-mail: neal.weston@ice.org.uk
Website: www.ice.org.uk

ICE aims to be a leader in shaping the engineering profession. With over 75,000 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 and comment, on a wide range of subjects from energy generation and supply, to sustainability and the environment.

LGC

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

Setting standards in analytical science

LGC, a science service company, is Europe's leading independent provider of analytical and diagnostic services and reference standards. LGC's market-led divisions - LGC Forensics, Food Chain and Environment, Life Sciences, Pharmaceutical and Chemical Services and LGC Promochem (for Reference Materials) - operate in a diverse range of sectors for both public and private sector customers.

Under arrangements for the office and function of 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 is based in Teddington, Middlesex, with other UK operations in Runcorn, Edinburgh, Culham, Risley and Tamworth and facilities in France, Germany, Italy, Poland, Spain, Sweden and India.

University of Leeds

Contact: Mrs K Brownridge,
Director of Research Support,
Research Support Unit, 3 Cavendish Road,
Leeds LS2 9JT
Tel: 0113 3436050
Fax: 0113 3434058
E-mail: k.brownridge@leeds.ac.uk
Website: http://www.leeds.ac.uk/rsu

The University of Leeds is among the largest research universities in Europe. We have some 3000 researchers, including postgraduates, and an annual research income of more than £70m. Research activity extends across nine faculties representing most core disciplines and often crosses traditional subject boundaries. In the last Research Assessment Exercise, we had 35 schools rated internationally or nationally excellent.

London Metropolitan Polymer Centre

Contact: Alison Green,
London Metropolitan University
166-220 Holloway Road, London N7 8DB
Tel: 020 7133 2189
Fax: 020 7133 2184
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. The training courses are delivered through a programme of industrial short courses and customised courses and these, together with distance learning and other flexible delivery methods, lead to qualifications ranging from technician to Masters level. Recent successes include a WRAP sponsored programme to develop new commercial applications for recycled PET and several technology transfer projects with companies.

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, Financial Services and Home

We have over 400 stores in 31 territories worldwide, employing 65,000 people.

We offer our customers quality, value, service and trust in our brand by applying science and technology to develop innovative products and services.

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.

Merck Sharp & Dohme Research Laboratories

Contact: Professor Ray Hill, FMedSci
Licensing & External Research, Europe
Terlings Park
Harlow CM20 2QR
Essex
Tel: 01279 440168
Fax: 01279 440713
e-mail: ray_hill@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

Contact: Maria Estevez
Policy Assistant
Fishmongers' Chambers
110 Upper Thames Street, London EC4R 3TW
Tel: 020 7645 9500
Fax: 020 7645 9501
Email: maria.estevez@nesta.org.uk
Website: www.nesta.org.uk

NESTA aims to be the single most powerful catalyst for innovation in the UK. In everything it does, it is seeking to increase the UK 's capacity to fulfil its vast innovative potential. Through a range of pioneering programmes, it invests at every stage of the innovation process; providing early stage seed capital for promising ideas for new products and services; investing in UK talent to ensure it stays in the UK; and experimenting with new ways of engaging the public in science, technology and the creative industries.

National Physical Laboratory

National Physical Laboratory
Hampton Road, Teddington
Middlesex TW11 0LW
Tel: 020 8943 6880 Fax: 020 8943 6458
E-mail: enquiry@npl.co.uk
Website: www.npl.co.uk

The National Physical Laboratory (NPL) is the United Kingdom's national standards laboratory, 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 Environment Research Council

Contact: Sheila Anderson
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

University of Newcastle upon Tyne

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

The University of Newcastle upon Tyne is a member of the Russell Group of research intensive Universities. Newcastle has a considerable reputation in undertaking 'research with a purpose'. The University has a well balanced portfolio of research funding and has one of the highest levels of research projects funded by the UK Government Departments and a very significant portfolio of FP6 EU activity (with over 100 projects involving more than 1800 partners). The University is taking its commitment further through the development of Newcastle Science City.

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

Particle Physics and Astronomy Research Council

Contact: Nigel Calvin
Policy and Public Affairs Manager
Particle Physics and Astronomy Research Council
Polaris House, North Star Avenue
Swindon, Wiltshire SN2 1SZ
Tel: 01793 442176 Fax: 01793 442125
E-mail: nigel.calvin@pparc.ac.uk
Website: www.pparc.ac.uk

The PPARC is the UK's strategic science investment agency that directs and funds research in national and international programmes in fundamental physics.

It is this research into fundamental physics that lies behind some of the major technological advances of the 20th Century, and delivers world leading science, technologies and people for the UK.

Prospect

Contact: Sue Ferns,
Prospect Head of Research and Specialist Services, Prospect House
75 – 79 York Rd, London SE1 7AQ
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 and, 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: Tom McLaughlan,
Director of Communications
29 Great Peter Street,
London SW1P 3LW
Tel: 020 7227 0500 Fax: 020 7233 0054
E-mail: tom.mclaughlan@raeng.org.uk
Website: www.raeng.org.uk

Founded in 1976, The Royal Academy of Engineering promotes the engineering and technological welfare of the country by facilitating the application of science. As a national academy, we offer independent and impartial advice to Government; work to secure the next generation of engineers; pursue excellence; and provide a voice for Britain's engineering community. Our Fellowship - comprising the UK's most eminent engineers - provides the leadership and expertise for our activities, which focus on the importance of engineering and technology to wealth creation and the quality of life.

KEW GARDENS

Kew
PLANTS PEOPLE POSSIBILITIES
ROYAL BOTANIC GARDENS KEW
WORLD HERITAGE SITE

The mission of Kew is to enable better management of the Earth's environment by increasing knowledge and understanding of the plant and fungal kingdoms – the basis of life on Earth. Kew is fundamentally a scientific, amenity and educational organisation devoted to increasing knowledge and public understanding of plant and fungal diversity – how it came to be, what its current status is, how it can be conserved for future generations, and how it can be used in sustainable ways for human benefit.

Contact: Prof. Simon J. Owens
Tel: 020 8332 5212
Fax: 020 8332 5278
Email: s.owens@kew.org
Website: www.kew.org

SAVING THE WORLD'S PLANTS FOR LIFE

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: ri@ri.ac.uk Website: www.rigb.org

The Royal Institution has a reputation established over 200 years for its high calibre events that break down the barriers between science and society. It acts as a unique forum for informing people about how science affects their daily lives, and prides itself on its reputation of engaging the public in scientific debate. During 2006 the Ri is closed for the refurbishment of its Grade 1 listed building. The public and schools' events programme will continue throughout this time. For more details on this and our refurbishment plans, please see our website.

The Royal Society

THE ROYAL SOCIETY

Contact: Dr David Stewart Boak,
Director Communications
The Royal Society, 6-9 Carlton House Terrace,
London, SW1Y 5AG.
Tel: 020 7451 2510 Fax: 020 7451 2615
Email: david.boak@royalsoc.ac.uk
Website: www.royalsoc.ac.uk

Founded in 1660, the Royal Society is an independent academy promoting the natural and applied sciences. It aims to:

- strengthen UK science by providing support to excellent individuals
- fund excellent research to push back the frontiers of knowledge
- attract and retain the best scientists
- ensure the UK engages with the best science around the world
- support science communication and education; and communicate and encourage dialogue with the public
- provide the best independent advice nationally and internationally
- promote scholarship and encourage research into the history of science

The Royal Society of Chemistry

RS•C 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 much more than just a learned society. We lead the way as an independent source of advice on statistical issues and play a crucial role in raising the profile of statistics, through our links with government, academia and the corporate and voluntary sectors. We have a powerful voice at Royal Commissions, Parliamentary Select Committees and at public consultations, offering our own unique view on just about anything, from freedom of information to sustainable development.

The Science Council

the SCIENCE council

Contact: Diana Garnham,
Chief Executive Officer
The Science Council
210 Euston Road, London NW1 2BE
Tel 020 7611 8754 Fax 020 7611 8743
E-mail: enquiries@sciencecouncil.org
Website: www.sciencecouncil.org

The Science Council has a membership of over 27 professional institutions and learned societies covering the breadth of science and mathematics. Its purpose is to provide an independent collective voice for science and scientists and to maintain standards across all scientific disciplines. We are active in science policy issues including science in education, health, society and sustainability. In 2003 the Science Council was granted its Royal Charter and in 2004 it launched the Chartered Scientist (CSci) designation as a measure of high standards in the practice, application, advancement and teaching of science. We now have over 10,000 Chartered Scientists.

SEMTA

Technology Skills for Productivity & Performance

Contact: Dr Bernard Capaldi
Director of Industry Products and Services
SEMTA, Wynyard Park House,
Wynyard Park, Billingham, TS22 5TB
Tel: 01740 627000 Fax: 01740 644799
Email: bcapaldi@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 sector has 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, currently contributes over £74 billion per annum – about ten per cent – of total UK GDP.

Society for General Microbiology

Contact: Dr Faye Stokes,
Public Affairs Administrator
Marlborough House, Basingstoke Road,
Spencers Wood, Reading RG7 1AG.
Tel: 0118 988 1843 Fax: 0118 988 5656
E-mail: pa@sgm.ac.uk
Website: http//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

Contact: Andrew Ladds,
General Secretary and 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-looking people in 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 publish journals, books and the respected magazine *Chemistry & Industry.*

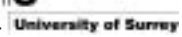
Society of Cosmetic Scientists

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.

University of Surrey



Contact: Katy Leivers
University of Surrey, Guildford,
Surrey, GU2 7XH
Tel: 01483 683937
Fax: 01483 683948
E-mail: information@surrey.ac.uk
Website: http://www.surrey.ac.uk/

The University of Surrey is one of the UK's leading professional, scientific and technological universities with a world class research profile and a reputation for excellence in teaching and learning. Ground-breaking research at the University is bringing direct benefit to all spheres of life - helping industry to maintain its competitive edge and creating improvements in the areas of health, medicine, space science, the environment, communications, ion beam and optoelectronics technology, visual multi media, defence and social policy.

Universities Federation for Animal Welfare

Contact: Dr James Kirkwood,
Scientific Director
The Old School, Brewhouse Hill
Wheathampstead, Herts. AL4 8AN.
Tel: 01582 831818. Fax: 01582 831414.
Email: ufaw@ufaw.org.uk
Website: www.ufaw.org.uk
Registered 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
www.scienceinparliament.org.uk

Monday 22 May 17.15
Annual General Meeting
Followed by
Science in Court: Expert Witnesses in the Dock
Speakers:The Baroness Kennedy of the Shaws QC
James Badenoch QC, Chairman, The Expert Witness Institute
Professor Robert Forrest, President, The Forensic Science Society

Monday 19 June 17.30
Human Reproductive Technologies
Speakers: Professor the Lord Winston
Professor Peter Braude, King's College London

Monday 17 July 17.30
Is Open Access the Future for Scientific Publishing?
Speakers to be confirmed

The Royal Institution

21 Albemarle Street, London W1S 4BS
Due to refurbishment, all Ri events are to be held at external venues throughout 2006. See www.rigb.org or telephone 020 7409 2992 for full details and to book tickets.

Friday 9 June 20.00
Inside out
Hilary Alexander, Dr Maura Banim and Dr Mark Lythgoe
Town Hall, Cheltenham

Saturday 10 June 12.30
Chocology
Dr Stephen Beckett
Town Hall, Cheltenham

Saturday 10 June 14.00
Anatomy for the terrified!!!
Dr Susie Whiten
Town Hall, Cheltenham

Wednesday 21 June 18.30
Taking chances
Dr John Haigh
Royal Statistical Society, Errol Street, London

Wednesday 5 July 18.00
Bridging the global digital divide
Jane Butler, Dr Matt Jones and Prof Tim Unwin
W5 @ Odyssey, Belfast

Wednesday 5 July 18.30
Climate change begins at home
Dr Dave Reay
Friends Meeting House, Euston Road, London

Thursday 13 July 19.00
Mathematicians behaving badly: Greenwich's place in the history of mathematics
Tony Mann
University of Greenwich

Tuesday 18 July 19.00
From bad to worse: the worst ideas on the mind
Prof Edgar Jones, Dr Joanna Moncrieff, Richard Webster and Prof Simon Wessely
King's College London

The Royal Society

6-9 Carlton House Terrace
London SW1Y 5AG
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. Please see www.royalsoc.ac.uk/events for the full events programme, more details about the event below and web casts of past events.

Monday 3 July 18.00-21.00
Tuesday 4, Wednesday 5 and Thursday 6 July 10.00-16.30
Royal Society Summer Science Exhibition
A showcase of some of the best science in the UK and an opportunity to talk to the scientists doing the research.

The Royal Academy of Engineering

29 Great Peter Street,
London SW1P 3LW.
For further information visit www.raeng.org.uk/events or contact events@raeng.org.uk

Monday 5 June
Academy Awards Dinner
Drapers Hall, London, EC2
For further details contact: Amy Abbott amy.abbott@raeng.org.uk

Tuesday 20 June
Quantum Computing & Cellular Phones
Speaker: Professor Robert Calderbank, Professor of Electrical Engineering & Mathematics, Princeton University
The Royal Academy of Engineering Lecture Series in Mobile Telecommunications & Networks
For further details contact: Amy Abbott amy.abbott@raeng.org.uk

---

The 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 take place at the RSE.

Monday 5 June
Biodiversity, Poverty and Sustainability for the 21st Century
Professor Peter H Raven

Monday 12 June
The Cassini-Huygens Mission at Titan
Dr Athena Coustenis

Wednesday 21 June
The Antarctic Ice Sheet and Climate Change
Dr Mike Bentley

The BA (British Association for the Advancement of Science)

Thursday & Friday 13 & 14 July
The Science Communication Conference
at the Institution of Engineering and Technology
For further details visit
http://www.the-ba.net/ScienceinSociety

SCI

14/15 Belgrave Square
London SW1X 8PS
Contact: conferences@soci.org
or 020 7598 1562
Unless otherwise stated events are at SCI

Monday and Tuesday 22 and 23 May
Challenges in Medicinal Chemistry: Proteinase 2006

Thursday 8 June
What a chemist needs to know about Patents

Wednesday 21 June
Introduction to Drug Discovery Chemistry - High Throughput Matters!
GlaxoSmithKline, Harlow

Monday & Tuesday 26 & 27 June
Biology for Chemists
Loughborough University

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

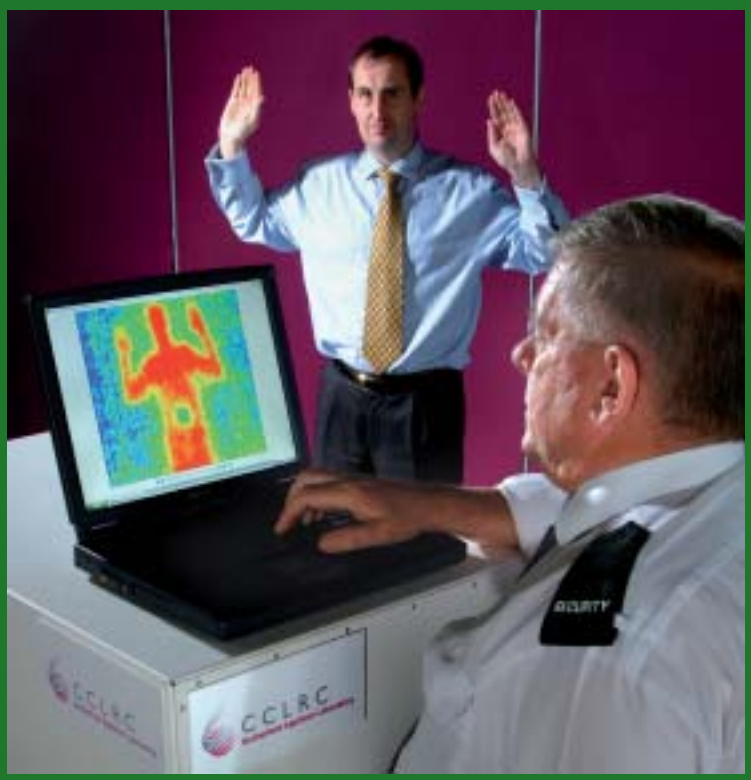
SCIENCE IN PARLIAMENT
Published by the Parliamentary and Scientific Committee, 3 Birdcage Walk, London SW1H 9JJ.
Published four times a year. The 2006 subscription rate is £65.00. Single numbers £16.25
ISSN 0263-6271
All enquiries, including those from members wishing to take the front or back covers, advertise in the journal or appear in the directory to Mrs Annabel Lloyd, Tel 020 7222 7085

Typeset and printed by APR Print and Design Ltd

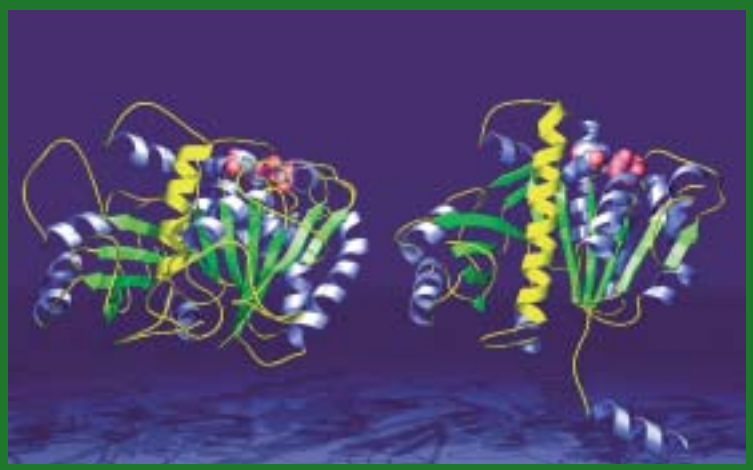
The CCLRC - Developing a World Class Model for Knowledge Transfer

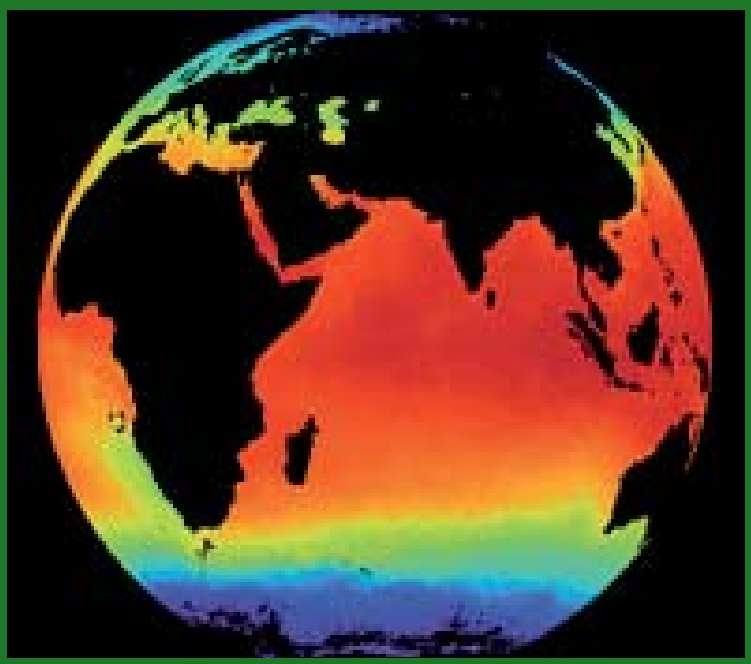
CCLRC

Thruvision, a spin-out from the CCLRC's Space Science and Technology Department, is aiming to become the leading commercial provider of compact security screening equipment using terahertz imaging technology. The image illustrates a scan by a Thruvision unit showing plastic concealed at waist level and is currently undergoing commercial trials.

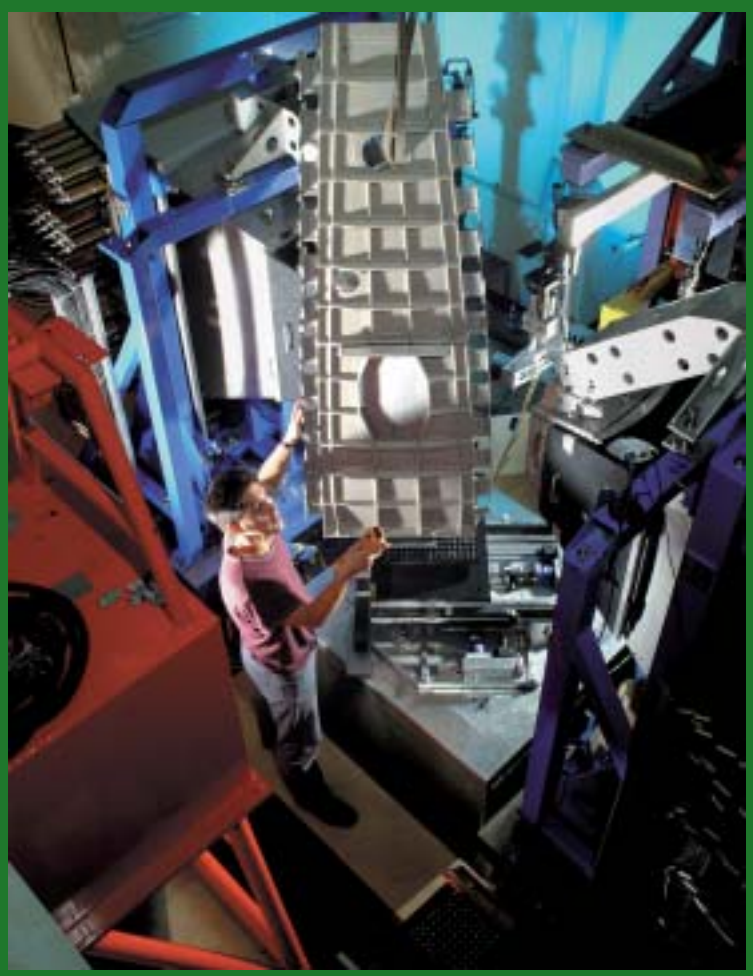


The protein structure of a molecule determined using crystallography techniques at the CCLRC's Synchrotron Radiation Source. In collaboration with Organon Laboratories, this technique was used to determine the crystal structure of a molecule which reverses the effects of drugs administered during operations performed under general anaesthetic, significantly reducing recovery times.





A global surface temperature map taken by the Along Track Scanning Radiometer (ATSR) instrument onboard an ESA satellite. The ATSR series of instruments monitor global sea surface temperatures for climate monitoring purposes. The ATSR series has been developed by the CCLRC Rutherford Appleton Laboratory with increasing industrial involvement. Thanks to this knowledge being transferred to industry Defra was able to procure the latest in the series direct from industry.



Positioning the wing strut of an Airbus A380 on the ENGIN-X instrument at the CCLRC's ISIS facility, the world's leading pulsed neutron and muon source. Fifty percent of the time on ENGIN-X is devoted to industrial customers with applications in the Energy, Aerospace, Automotive and Defence sectors.

www.cclrc.ac.uk