Autumn 2006

SCIENCE IN PARLIAMENT

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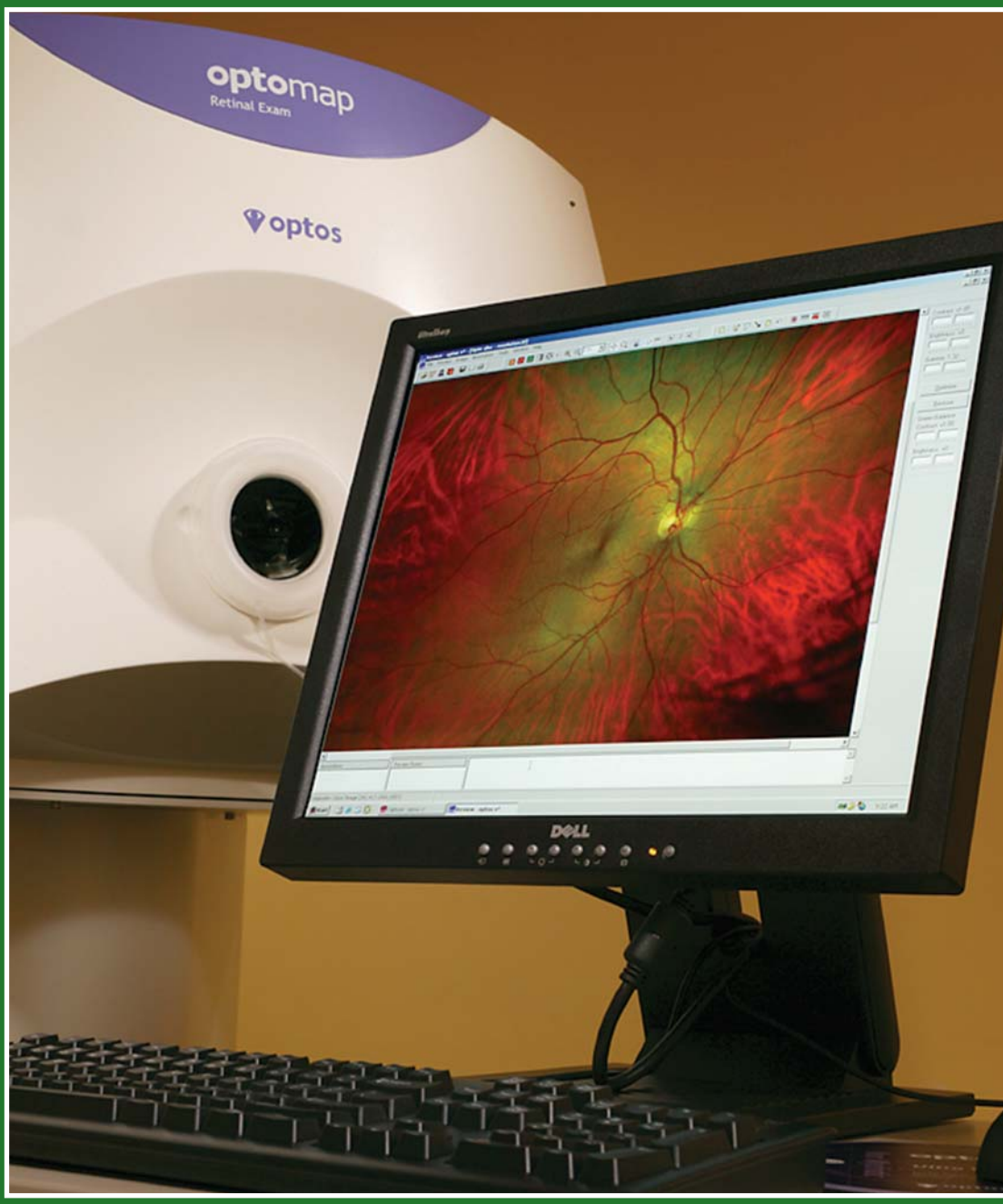

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SCIENCE IN PARLIAMENT

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

Welcome to the Autumn edition of Science in Parliament. As Chairman of the Editorial/Management Board of this Journal, I have been trying to encourage more coverage of the controversial aspects of science that might generate a "Letters Page". We welcome your views on the issues that we cover and others of current interest.

News that a single stem cell can be removed from an embryo, apparently without preventing normal development of the embryo, and that an adult cell can be "wound back" to a stem cell have given great hope to this rapidly developing field of science.

The GM crops debate is back on the agenda with BASF's announcement of a blight-free potato. With most countries in North and South America, China and India, and even countries closer to home, such as Spain, now growing GM crops, how long can Britain remain GM crop free? Some argue that public reaction to GM crops has damaged Britain's biotechnology industry badly. We need a sensible and well-informed debate free of the emotion of earlier debates.

This Summer has seen the publication of the usual Annual Reports of a plethora or organisations – State Departments and their agencies included. For those who have the time to read them, they contain a wealth of information which, fortunately, suggests that our science base is healthy for the time being. The Food Standards Agency published its "Science Strategy 2005-2010" in July (http://www.food.gov.uk/science/).

I congratulate Universities UK for publishing "EurekaUK", which describes "100 discoveries and developments in UK universities that have changed the world". I had great pleasure, on 25 July, in presenting the President of the American Chemical Society with a copy.

Dr Brian Iddon MP
Chairman, Editorial Board
Science in Parliament

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OPINION

Claire Curtis-Thomas MP

Engineers everywhere are doing what they do best as I write, they're beavering away and delivering what the customer ordered, from sky scrapers to a new central heating system; and therein lies our problem, that while we love what we're doing, we don't spend much time talking, and because we don't talk about the amazing world that we are constantly creating, we go largely unnoticed and unsupported. Generally most of us have no problem with that situation at all – we want to be left to get on with our work. However, such systemic and fundamental reserve creates problems when you're trying to recruit young people into engineering.

I became involved in engineering accidentally, and I loved it immediately and the skilled people who spent day after day creating perfection from the elements of the earth. But, however attractive the position of being the only young woman working with approximately three thousand men might sound, it was horrible for most of the time: half of my colleagues didn't want me in work with them and the other half wanted me there, but for the wrong reasons. Another two young women started apprenticeships a year after me, but within six months they had quit, for reasons I understood perfectly well. However I was determined not be forced out of a job that engaged me absolutely, but by then armoured tanks had skins which were thinner than mine. I was determined that, apart from gaining my apprenticeship, I would try and encourage more young women into my world, knowing that if there were more of us, it would be easier to survive and realise our potential.

I started my recruitment campaign a few years later by becoming one of the founders of the Women in Science and Engineering (WISE) in Wales, and along with some magnificent, formidable, pioneering women we embarked on a nationwide schools visits programme. I was assigned to the five to seven year olds, and they spent years teaching me how to make a good paper plane. I have no idea how many of those WISE young children went on to become scientists or engineers, but I do know that we all learnt a lot and we had fun. Irrespective of the fact that we all felt good, evangelising on behalf of our various disciplines, the impact of our programme was negligible; the vast majority of teachers knew nothing about science and engineering, and we found that most parents wanted their children to go into "clean jobs". We realised that to increase the number of young people going into Science, Engineering and Technology (SET) related careers we would have to sustain our activity for decades and to involve industry – we needed their money to pay for school visits and we needed their employees to join us to talk to young people everywhere. That task seemed impossible then and it still feels impossible now, but thirty years later there is an understanding that getting young people into engineering is not a task that business can leave to government, it is something that all companies have to become involved in themselves if they want to secure the brightest and best candidates.

I have moved house fourteen times with my work and every time I have sought out colleagues who would be prepared to help me establish a schools visit programme locally; sometimes these initiatives failed when I moved on. However in 1995, along with two other tremendous women, we established SET UP – a charity whose primary purpose was to promote science, engineering and technology to young people from the age of five to eighteen, irrespective of gender, creed or intellectual ability. The charity is in its eleventh year and we have achieved much together – from our earliest days we committed ourselves to a programme of work that would last twenty years, would support the school curriculum and be subject to rigorous quality control.

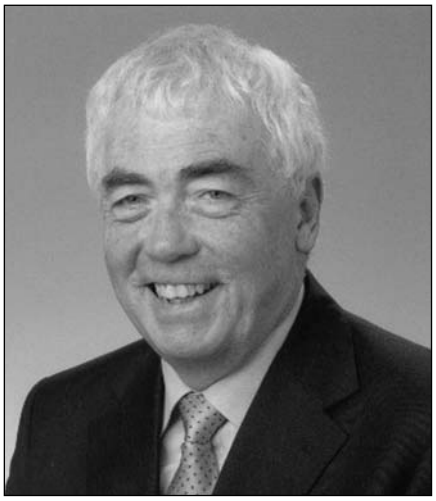
During the annual science week in March, the SET UP team delivers a programme of over 150 events to four thousand children, half of whom are under the age of eleven. These events include opportunities for visits to factories or engineering work sites or school visits by engineers or scientists. Our presentations support the national curriculum and vary from "What happens when you flush the toilet" to "It's in your genes – haemophilia in the Royal family". Hundreds of volunteers, who have a love of engineering or science, help to organise or deliver the SET UP programme, as we want to share that with young people so that they might join us some day – and gratifyingly some have done so.

Today, our volunteers will be working on next year's programme; engineers and scientists like planning and building something better – I just wish we would talk about it all just a little bit more!

OPINION

Mission Impossible?

Phil Willis MP
Chair, House of Commons Science and Technology Select Committee



"Mission impossible" was how one Member of the Science and Technology Committee described my appointment as Chairman just over a year ago. As a "non scientist", how could I possibly step into the shoes of Dr Ian Gibson and command any respect from the scientific community? Indeed given the remarkably high profile Ian had given the committee, surely the promotion of science and technology within Parliament would be diminished?

The answer was not to try and replicate a formula that had produced ground breaking Reports such as *"Forensic Science on Trial"* and *"Human Reproductive Technologies and the Law"* but to create new directions and different ways of working. Building on such superb foundations made my job "mission incredible" not "impossible" and so it has transpired.

The learning curve has been steep but hugely exciting. I began by trying to meet as many key figures in the scientific world as possible and quickly learnt this was a near impossible task – so rich is the UK in scientific talent. Whether in Swindon meeting Professor Ian Diamond and his fellow Research Council Chief Executives, the Royal Society and the Royal Academy of Engineering with the eminent Lords May and Broers or the DTI with Lord Sainsbury, Sir Keith O'Nions and the remarkable Sir David King – the message I received was the same. The scientific community is excited and proud about what it does, is anxious to share its achievements and aspirations and is often frustrated that parliamentarians do not engage as effectively as they might.

Certainly by the time the new Science and Technology Committee undertook its first Inquiry *"Carbon Capture and Storage Technology"*, I was well aware of the responsibility to and the expectation from the science and technology community. I had also been made aware that Select Committees have established ways of working and change is not always welcome! The task of deciding new Inquiries was more difficult than I had envisaged, primarily because individual Members have such diverse and complex interests and there are an abundance of exciting areas to explore. Achieving consensus was sometimes challenging. However the Committee has embarked upon some new and hopefully useful ways of working.

The recent inquiry into *"Scientific Advice to Government"* which examined the Government's commitment to evidence based policy making used three case studies to explore in more depth the issue of scientific advice and risk. The technology underpinning the Government's plans for ID cards, the classification of drugs and the EU Physical Agents (Electromagnetic Fields) Directive relating to the use of MRI scanners enabled three highly topical Reports to be published prior to the overarching Report in the autumn.

The Committee also embarked upon its first thematic inquiry into the work of the Research Councils, taking as its first theme the Councils' approach to knowledge transfer in recognition of the growing emphasis placed by the Government on innovation.

Perhaps one of the most rewarding aspects of my first year as Chairman was the Committee's agreement to take a more systematic approach when looking at recommendations from past Inquiries and ask the question "do we as a Committee make a difference?" Individual Members are re-visiting commitments made by Ministers to Reports produced over the past five years to see if they were carried out – a process which I would like to see formalised across the Select Committee structure.

Of course the real excitement comes from the oral evidence sessions. Michael Jopling, the former cabinet minister, once said, *"Select Committees are giving backbenchers teeth with which to challenge the executive"*. He was right. There is a real sense of engagement with Ministers that I have previously never felt at departmental questions in the Commons and a willingness to engage in the subject under scrutiny. The same excitement comes from examining the evidence or responsibilities of other witnesses too.

To hear Olympic sprinter Linford Christie present his views on doping in sport at our seminar to launch the *"Human Enhancement Technologies in Sport"* Inquiry or Alasdair Smith, the Vice Chancellor of Sussex University, defending his policy to close a Chemistry Department brings the work of the Committee alive and makes it immediately relevant.

So what of the future? Well let me begin by acknowledging the tremendous support given to me by Members of the Committee and by an exceptional group of Clerks, scientific specialists and support staff. Despite having to work without two Members for most of that time the co-operation and engagement has been quite superb. We immediately begin work in October on a new Inquiry into *"Space"* and whilst a Committee visit has been ruled out, this should prove to be an extremely topical and exciting inquiry for any new member who wishes to join the Committee!

Last year was truly "mission incredible" and this year promises more of the same!

Changes in 25 years of Computing

Charles Hughes
President of the British Computer Society

A quarter of a century is a very long time in computer history terms; if one accepts the world's first electronic computer was developed at Bletchley Park by Alan Turing and his team a mere 60 or so years ago. From there to the first commercial computer, LEO, from Joe Lyons the bakers took a decade.

Now advances proceed with breathtaking speed which is why the last twenty-five years have been so dramatic. When the British Computer Society was formed nearly fifty years ago, computers were "built" and often bespoke. The modern revolution began 25 years ago in 1981; IBM released their new desktop computer, the IBM PC or personal computer.

The first IBM PC was slow (4.77 MHz) and came equipped with only 16 kilobytes of memory, expandable to 256k. It had a price tag of around £820 which would be over £2000 today.

The transformation of integrated circuitry into the micro chip and the inevitability of Moore's Law was the technology which propelled the PC into the ubiquitous tool that is now part of most of our lives.

The next important contributor to computing's evolution was the Internet. Facilitated by the TCP/IP protocol, which set the rules for communications between computers, the Internet, which had its roots in developments started in the 1960s, became readily available with the creation of the web in 1991 by Sir Tim Berners-Lee, whilst working at CERN.

Berners-Lee told CNN that the idea behind the Internet was making information accessible to all. "Wouldn't it be nice if actually all the information out there were in a what-you-see-is-what-you-get form?" Berners-Lee said. The World Wide Web, with its user-friendly applications, coupled with the first public access web browser Mosaic, has transformed computer usage, and information access and transmission, for all of us.

Next on the list comes the cell phone, which may have been conceived as early as the late 1940s, but wasn't widely adopted until the FCC authorised cellular service in the early 1980s. Although initially launched as a simple analogue based radio receiver and transmitter, today's cellular phones and their offspring – the PDA – are fully functional computers that fulfil most of the core functions of the PC.

The PC has created wealth on a massive scale. The combined stockmarket values of PC hardware and software firms exceed half a trillion dollars. Cheap computers have boosted the productivity of individual workers. And hundreds of millions of people have benefited from access to word-processing, spreadsheets, e-mail, file-sharing and cheap phone calls – to say nothing of the riches of the web. And we now all use computers on a daily basis whether overtly with our PCs or PDAs or indirectly in our cars, televisions and washing machines, through the telephone networks or ATMs and as customers of government and business services.

The PC democratised computing by making computers cheaper and more accessible than the huge mainframes that came before. But the PC is no longer centre of the technological universe; today it is more likely to be just one of many devices orbiting the user. You can now do e-mail on a BlackBerry, plug your digital camera directly into your printer, and download music directly to your phone – all things that used to require a PC.

The growth in IT – over one million UK citizens now work in the industry – has necessitated a huge growth in the supply of skills training and qualfications at all levels. Here the BCS has rightly fulfilled the remit of its Royal Charter to engage the broader public with the advantages of and the skills to use IT.

The BCS has made enormous strides on the professionalism front over the past few years. But we also recognise that there remains much to be done before we can claim to have a mature IT profession within which professional qualifications are seen as a "must-have" for business rather than as an optional extra for individual practitioners. Even with the increase in BCS membership to over 55,000, there is still only a small minority of practitioners in membership of any professional body and few employers yet require professional qualifications as part of their recruitment practice. The Government has recognised the challenge by appointing a Director for IT Professionalism and offering strong support for the BCS campaign.

The Parliamentary IT Committee (PITCOM) and BCS have strong links and we both welcome active support from all quarters.

Computers have changed the world and will continue to do so. We all need to ensure that the transformations to come do deliver real benefits to society.

Charles Hughes is President of The British Computer Society, an Executive Council Member of PITCOM and Chairman of the Programme Committee and a Court Assistant of the Information Technologists' Company. His 40 year career in IT has spanned the supply side and central government and he now directs eManagement Limited, offering guidance on the effective implementation and use of IT.

Why Nuclear Power is Needed in a Low Carbon Economy

Professor Sir David King, Chief Scientific Adviser

Carbon dioxide levels are now about 40% higher than at any time in the past 740,000 years at least, and due to the inertia of the global system further warming will occur over the next few decades regardless of action on emissions reduction. Current warming is already having its effects: sea ice is melting, glaciers are receding, sea levels are rising and the oceans are becoming more acidic. What's more, in the past 30 years the number of strong hurricanes, the equivalent category to Katrina, has doubled.

We now face serious challenges from pressures on natural resources and the environment. The science of climate change is becoming more certain by the day and the causal link to increased greenhouse gas emissions largely caused by the use of fossil fuels is now well established.

There is no single solution to reducing emissions. We, like any country, need a full complement of mitigating actions, covering all sectors and addressing the key issues of low carbon energy, fuel poverty and security of supply.

It is certainly not a simple question of deciding between "nuclear vs renewables vs energy efficiency". I believe we need every tool in the bag, including a step change in the rate of energy efficiency improvement, a much greater contribution from renewables, major progress in the transport sector to stabilise and start to reduce emissions, and the large-scale demonstration and deployment of carbon capture and storage for fossil fuels. I am also a fan of maximising the contribution of combined heat and power, decentralised energy and so called "micro-generation" technologies, which can operate at the scale of an individual household.

I believe strongly that a "stabilisation wedges" approach can be a valuable framework in scoping the scale of the challenge and in providing a strategic framework for future planning and delivering on our low carbon economy.

Energy efficiency is clearly a win-win option for all of us; it addresses both our carbon and security of supply goals. The projected growth in energy demand will currently cancel out any efficiency savings made. Energy efficiency is a theme that cuts across all sectors. In the domestic sector, we must move quickly to ramp up new housing standards. More challenging is achieving improvements in existing buildings. Action to raise the profile of energy efficiency in the business and public sectors is also a key issue for both buildings and products. Crucially, the proposals must encompass both heat and electricity – too often the focus is placed on the former at the expense of the latter. The savings we make on energy efficiency will reduce the number of new power stations we will have to build during the next 40-50 years.

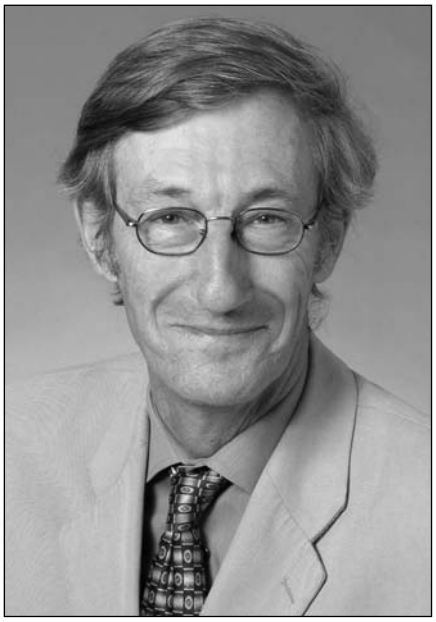
It has become increasingly clear while reviewing the evidence for the Energy Review that we were falling even further behind in meeting our CO_2 emissions goals. A key factor for this is the rapid decline in carbon-free energy to the grid from nuclear fission as existing plants close. In 2001 the contribution of nuclear power to grid electricity was 27%. By 2010 this will have fallen to around 18%, and by 2020 to just 7% – effectively more than offsetting the contribution expected from renewables over the same period.

Nuclear power currently accounts for 20%, or one fifth, of our electricity generation and is an important part of the low carbon equation. The question is shouldn't we replace that, so that we can keep that source of electricity? It is only about one fifth, and what we need in the future is a good electricity balance. Each year we delay any new nuclear build means an additional 35 million tonnes of carbon dioxide are emitted to the atmosphere (about 6% of total CO_2 from all sources), assuming that gas fills the gap as nuclear capacity declines. In some scenarios the position could be worse, if gas prices remain high and coal becomes more competitive.

Let me make it clear, if there were other sources of low carbon energy that could replace our generation of nuclear while ensuring security of supply and eradication of fuel poverty I would be in favour of them, but there aren't. Nuclear power is an important source of low carbon electricity in the UK and that it why the UK Government has said nuclear power will play an important part in meeting our energy goals.

This may well be the last generation of new nuclear fission power plants in the UK. In 35 years time the ITER project may well yield the availability of commercial fusion power plants, with zero radioactive waste implications, like energy efficiency this could be another win-win.

Being NICE: Making the best use of our health resource



Professor Sir Michael Rawlins, Chair of NICE, highlights the challenges ahead for the National Institute for Health and Clinical Excellence (NICE) in providing national guidance on the promotion of good health and the prevention and treatment of ill health

Along with the expected complexities of working in, and on behalf of, a rapidly changing health system it has been an important eighteen months in the evolution of NICE's programmes. Having taken on responsibility for producing public health guidance for the wider public health community, after merging with the Health Development Agency in April 2005, the Institute has now produced two pieces of public health interventions guidance (smoking cessation and physical activities interventions). And much more is to come with public health programme guidance on the prevention, identification, assessment and management of overweight and obesity in adults and children expected in November 2006.

NICE has also developed a fast-track appraisal process for assessing new life-saving drugs more quickly. Known as the "Single Technology Appraisal" (STA) process, this will assess the clinical and cost-effectiveness of treatments in parallel with the licensing process.[1] The first such drug to gain approval through this scheme has been the breast cancer drug Herceptin, and more are on the way.

NICE is rarely out of the headlines. The *quid pro quo* of inclusiveness and consultation means that NICE guidance often takes longer to produce than many stakeholders would like.[2] We have been acutely aware of this, and have responded by introducing the new "STA" process. Equally, we appreciate the need for some of our guidelines to be developed in a speedier manner – especially where there is urgency and/or the topic covers a relatively small area.

We are also prepared to be flexible revising our existing guidance when important, new evidence emerges. Our clinical guideline on hypertension, for example, was revised in collaboration with the British Hypertension Society to take account of the findings of the ASCOT trial. As a consequence, an amended version of our guideline was published well before the planned review date.

We are also continuing to provide support to the NHS in implementing our advice. Our implementation programme now offers a range of tools and resources to help the introduction of our guidance at the time of, or soon after, its publication. Our aim is to do everything we can to make sure that those to whom our guidance is directed are able to benefit fully.

Our new public health programmes will provide guidance on promoting good health and preventing ill health. This will include supporting the public in making better, and more informed, choices; and it will provide the NHS, local authorities and the wider public health communities (especially the voluntary sector) with guidance about effective and cost effective measures to achieve these same goals.

The merger of NICE and the HDA was seen, by some, as a cost-cutting measure. It is true that the merger has saved money; but the synergies between the two organisations means that the "new" NICE is more than the sum of the two parts. It has ensured, for example, that public health considerations are starting to permeate NICE clinical guidance as has occurred with advice on the prevention of tuberculosis and the prevention of obesity.

NICE guidance

NICE now produces guidance for health professionals, patients and the wider public in three areas:

Public health: guidance on the promotion of good health and the prevention of ill health for those working in the NHS, local authorities and the wider public and voluntary sectors.

Health technologies: guidance on the use of new and existing medicines, devices and procedures within the NHS.

Clinical guidelines: guidance on the appropriate treatment and care of people with specific diseases and conditions within the NHS.

For all these forms of guidance, the Institute takes account of evidence-based effectiveness and cost effectiveness. The requirement to consider economic issues, laid out in our statutory instruments, is sometimes controversial but inevitable.

Who chooses the topics for NICE's work programme?

Ministers are responsible for selecting the topics for all NICE's programmes. Full details of the process they follow can be found on the Department of Health website at www.dh.gov.uk .

Suggestions for topics about which NICE should develop guidance come from a number of sources including healthcare professionals, patients, carers, the general public, the National Horizon Scanning Centre and the Department of Health's National Clinical Directors. Until July this year the topic selection process was undertaken by the Department of Health. This has now been devolved to NICE itself; and although ministers will have the final responsibility for topic referral each will be worked up by the Institute's staff.

Geographical remit

NICE produces technology appraisals and clinical guidelines for the NHS in England, Wales and Northern Ireland, and public health guidance for the NHS and local government in England. NICE's guidance on the safety and efficacy of interventional procedures, which decides whether interventional procedures are safe and work well enough for use in the NHS, covers England, Wales and Scotland. Other guidance for the NHS in Scotland is developed separately by NHS Quality Improvement Scotland (technology appraisals) and the Scottish Intercollegiate Guidelines Network (SIGN).

Although NICE has no responsibility for healthcare outside the UK, there has been an extraordinary interest in its evolution, methodologies and effectiveness. Analogous institutions have now been established in Greece, Germany and France; and a Portuguese agency will begin work shortly. Our website also has visitors from across the globe.

How will NICE fit into the public health sector?

NICE guidance supports evidence-based decision making by the public health community at large. The public health topics which have been selected are those which are associated with the major avoidable forms of ill health and premature death. They include measures to reduce tobacco and alcohol consumption, to encourage exercise, to promote better nutrition, and to improve sexual health. They will also incorporate approaches to reducing substance misuse and sustaining mental health.

How does NICE fit into the NHS?

NICE and the National Service Frameworks are responsible for setting clear national standards for NHS services and treatments. The Department of Health's document *Standards for Better Health* sets out how NHS organisations should respond to NICE guidance.

NHS Primary Care and Hospital Trusts are responsible for commissioning and delivering high quality healthcare. This is done through their clinical governance arrangements and are underpinned by modernised regulation of health professionals (including continuing professional education). The Healthcare Commission plays a special role through its clinical governance review of Trusts' performance. Further information can be found in *Assessing the Standards* at www.healthcarecommission.org.uk.

The future

NICE will continue to serve the clinical and public health communities. In doing so it must demonstrate that it is using tax-payers' money effectively, and with tangible benefits for patients and the public. Unquestionably, its most difficult task is to explain to the professions, patients and the public that there is a finite limit to NHS resources. It is the Institute's responsibility, in giving advice to the NHS, to consider the best interests of all those who depend on the NHS for their care balancing fairness with the common good.

[1] Unlike the NICE process, which has up till now only assessed licensed drugs for their clinical and cost-effectiveness which have been specifically referred to us by the Department of Health, all drugs must first of all receive a marketing authorisation, based on whether they are safe and whether they work, from the Medicines and Healthcare Products Regulatory Agency (MHRA) or at a Europe-wide level from the European Medicines Agency (EMEA) before they can be freely prescribed.

[2] The Department of Health has however made it clear to the NHS in guidance that it is not acceptable to refuse a treatment simply because NICE guidance does not yet exist. The NHS must make its own assessment based on available evidence.

NICE was established, in 1999, as the National Institute for Clinical Excellence and further information can be found in *The New NHS, Modern and Dependable* and *NHS Wales, Putting Patients First* and in *A First Class Service: Quality in the New NHS*, published by the Department of Health, and *Quality Care and Clinical Excellence*, published by the Welsh Assembly Government. Information about the HDA can be found in *Saving Lives, Our Healthier Nation* and *A Research and Development Strategy for Public Health*. These documents are published by the Department of Health: visit the Department of Health website at www.dh.gov.uk

Museum of Science and Industry in Manchester

Dr Ian Griffin, Director

Manchester was the world's first industrial city and has been a centre of innovation in science and engineering from the start of the Industrial Revolution. Dalton and Joule carried out groundbreaking work here, and it was just outside the city that Sir Bernard Lovell created Jodrell Bank in time for the dawn of the space age. It is therefore appropriate that the Museum of Science and Industry in Manchester (MSIM) exists today to showcase the region's contributions to science and its rich industrial heritage. We also strive to act as a vehicle to promote science and engineering and to inspire the next generation of creative people who will keep our country at the forefront of scientific and technological innovation.

MSIM is a relatively young institution, with origins dating back to the mid-1960s. Back then, Donald Cardwell, a Professor at the University of Manchester Institute for Science and Technology (UMIST), realised that the closure of local manufacturing industries was leading to the loss of items of significant scientific and industrial heritage. He decided to prevent this, and started collecting artefacts and records from local factories and mills as they closed down.

The UMIST collection became the nucleus of a new museum, the North Western Museum of Science and Industry, which opened in 1969. During the 1970s the museum became a victim of its own success when its collection and visitor numbers outgrew the existing facilities. Luckily an opportunity to re-locate the Museum to a new site presented itself when, in late 1978, after mounting public pressure, British Rail sold the historic, but derelict and unused, site of the world's first passenger railway station, on the Liverpool Road in Manchester to the Greater Manchester Council.

The sale, for £1, enabled the renovation of the passenger station and a freight shed and the site, together with the UMIST collection, became the founding assets of the Greater Manchester Museum of Science and Industry Trust in 1981. The Museum opened at Liverpool Road Station on 15 September 1983, the 153rd anniversary of the opening of the Liverpool & Manchester Railway.

In 1985, another opportunity to expand arose when Manchester City Council asked the Museum to take over the Air and Space Museum, which the City Council had opened in May 1983. The Air and Space Museum was housed in the adjacent Lower Campfield Market Hall. An agreement was reached and the Museum thus acquired its Air and Space Hall with an unique collection of large aircraft, including an Avro Shackleton.

In 1986 the abolition of the metropolitan county councils, including GMC, meant that the Museum needed a new source of core funding. Fortunately, the Museum was successful in making a case for receiving core funding from national government through the then Office of Arts and Libraries, and today continues to be nationally funded as a NDPB by the Department for Culture, Media and Sport.

Today the Museum occupies a large (2.5 hectare) site in the centre of Manchester, whose five listed buildings contain seventeen galleries. The ongoing development of the Museum from its humble origins has depended heavily on raising money through grants (from sources such as English Heritage, the European Regional Development Fund and the Heritage Lottery Fund), commercial sponsorship and through its own trading activities which generate significant income from catering, retail and other commercial activities such as hosting large touring exhibitions.

The Museum's success in fund-raising has been demonstrated through its continuing expansion, providing new galleries and other public facilities. Its reputation for excellence has been endorsed by the many awards that it has received, including the Museum of the Year award in 1990 (jointly with the Imperial War Museum). Public

Characters you may find in the Museum

Replica locomotive, Planet, steaming past the Grade1 listed building.

appreciation has been evident in the Museum's healthy visitor numbers, which peaked at just over 350,000 in 1998-99. The resumption of free admission in December 2001 boosted visitor numbers, which reached a record 492,000 in 2004-05.

From the beginning this Museum has been committed to the restoration of machinery to working order and to maximising public access to our collections, which are designated by the Museums, Libraries and Archives Council as being "pre-eminent collections of national and international importance". Amongst our most popular galleries are the Power Hall, which contains a large number of fully working historic machines, and the Textile Gallery, where visitors can see the entire textile manufacturing process, from cotton to woven garment, demonstrated, again using the original machinery.

Like most museums, despite the fact we have a relatively large city centre site, we are only able to display a small fraction of our collections in our permanent galleries. Unlike most museums, despite the large physical size of much of our collections (such as printing presses and aircraft!), we can also provide access to about a third of our reserve collections through our on-site Collections Centre.

With a site of such historic significance and a large and growing collection, the staff at the Museum have their work cut out simply to preserve, protect and interpret our rich heritage. However, as an Institution we have great ambition. In addition to preserving, protecting and interpreting the collection, we have developed and are implementing a vision that has identified six key themes: Energy, Community, Science, Transport, Industry and the Environment which will be used as channels to showcase and interpret the past, present and potential future interactions of people, science and industry.

Through researching, recording and sharing the stories behind every building, artefact and archive at the Museum, we aim to use our collections to inspire interest in science, technology and engineering, helping to create a more science-literate society. In our quest to achieve this goal, a new master plan is being created for our institution. We know that to be successful we must reach a diverse audience, and need to make our collections challenging, relevant and accessible to all.

Partnership with other organisations is another important aspect of our vision since it allows us to use the skills and expertise of others to help us develop. For example we have recently enjoyed a most successful collaboration with the Foundation for Science Technology and Civilization (FSTC) to host an exhibition on the Muslim contribution to civilization. The result of this partnership is "1001 Inventions: Discover the Muslim Heritage in our World" which is a unique UK-wide travelling exhibition. It forms part of an educational project, which aims to bridge the gap in understanding of the rich heritage that the Muslim community share with other communities in the UK and Europe. The project also includes a concurrent events programme and provision of educational resources.

1001 Inventions focuses on the period between circa 600-1600 AD referred to in the West as the "Dark Ages" which was a time when science was in fact actually very much alive and flourishing in Europe and elsewhere. It was the period when Muslims flourished in science and it provided the springboard from which the renaissance emerged. The exhibition looks at this one thousand-year gap of science and technology and highlights some of the main Muslim contributions to civilization and the pioneers behind them, to inspire a similar innovation from current and future generations.

The exhibition and indeed the partnership has been a tremendous success for the Museum. An independent evaluation has determined that it has driven over 10,000 new visitors to the Museum (the majority of whom are Muslim) and importantly that is having a positive impact on them when they are here. The exhibition will tour throughout the UK for a period of two years from September 2006.

In summary, our Museum has evolved over the past two decades from an industrial wasteland to a successful museum whose 17 galleries regularly attract nearly half a million visitors per year, all of whom want to find out more about past, present and future achievements in science and technology. Our success continues to be founded on the energy and motivation of our staff, together with the ongoing support from the Department for Culture, Media and Sport. As a national and regional asset, we have taken the uniqueness of our site and embraced the notion of "inspired learning for all" as a key focus of our activity, creating a real sense of purpose in showcasing our unique collections to wider communities. We are determined to ensure that everyone who visits our Museum, whether novice or knowledgeable, young or old, has a real chance to become engaged in shaping the future of this country.

Enriching the Science Learning Experience

Yvonne Baker, Chief Executive, SETNET

Each year successful pupils are pictured leaping in the air clutching that all important GCSE and A-level results paper, while proud parents and teachers share in their exhilaration and breathe a sigh of relief.

A-level and GCSE results undoubtedly stir mixed emotions, questions are raised on standards with the increasingly loud chorus of "are they too easy?" and single science and maths performance is put under the microscope.

Science exam results were in the headlines particularly this year as the CBI talked of the growing crisis in recruiting skilled scientists and engineers and the threat of this gap to international competitiveness. There is no doubt that a large number of the UK's wealth-creating businesses are facing recruitment issues and we frequently hear these concerns from our corporate supporters not just at a graduate intake but also at a technician level.

From some of the media coverage, the general public could be forgiven for thinking that science in school is generally in a dire situation. However, although science teachers would be the first to tell you that there are always things that could be improved, there are many positive steps under way to tackle the challenge of encouraging more young people to pursue science, technology, engineering or mathematics (STEM) in their further studies and careers.

To support teachers in their ability to engage and inspire the next generation SETNET, the national Science, Engineering and Technology Network, was established in 1996. SETNET is tasked with bringing STEM activities and excitement into schools and colleges throughout the UK, enhancing and enriching the STEM curriculum. It does this through working with a range of partners, including its UK wide network of local SETPOINTs – organisations skilled in facilitating education-business links and working with other STEM partners to provide access to high quality meaningful activities for students and schools. Furthermore, by linking schools to those companies and organisations that employ STEM-educated people, students can begin to get a clearer idea of the extensive and diverse range of careers available to them.

SETNET is one of the Government's principal agents for encouraging young people's engagement with STEM at school and we are continuously expanding our work, connecting with even more schools.

The need for such assistance is more relevant than ever as the new Science GCSE curriculum brings a much stronger focus on real-life applications of science and the issues surrounding scientific debate. Our goal is to work with the teaching profession to support and, where appropriate, deliver activities designed to complement these changes.

And whilst we firmly believe that the most important influence in engaging young people in STEM education is the quality of teaching, young people may not be sufficiently attracted to science qualifications if they cannot see rewarding and relevant careers at the end of their study.

The issues are complex, but we share the view widely expressed in the STEM community that much of the available formal careers advice still does little to dispel myths about science being for "boffins", IT for "geeks" and engineering for those who don't mind being "tough and grubby".

For example, you only have to look at the numbers of women studying computer science (26% of total CS students) or engineering (14% of total engineering students) to know that a perception problem still exists.

It is the role of SETNET and its UK-wide network of SETPOINTs to help break down these perceptions. We want to make an impact on the career choices of young people by demonstrating through added value educational activities the relevance of STEM in today's world and the superb opportunities it offers.

That's quite an ambition in today's environment when young people are choosing not to study the "hard" and "boring" STEM subjects beyond the statutory minimum point but one we are confident we can achieve.

SETNET, together with our wide range of partners, provide a complementary range of services to those formal educational activities which were strengthened in the Government's "Science and Innovation Investment Framework (SIIF) – Next Steps" document published alongside the budget in March.

With strong links to business and industry at a local, regional and national level, SETNET, the SETPOINTs and our associated partners can provide schools with access to a wide range of programmes, resources and activities to help give a "real world" sense of how STEM subjects can lead to a variety of employment opportunities. SETPOINTs may also be able to help schools by delivering some of those activities, or by pointing teachers to others who can do so.

Many such activities can be supported by our Science & Engineering Ambassadors (SEAs) programme – individuals from a wide variety of STEM backgrounds, from across the UK, who have offered their time and expertise to help schools inspire young people. Having a genuine focus on a future career path can act as a real stimulus to young people in achieving better qualifications.

The volunteer Ambassadors cover a broad spectrum of STEM disciplines and careers – from marine biologists to mathematicians studying climate change, aeronautical engineering apprentices to medical physicists and industrial chemists to electrical engineers developing satellite technologies.

SETNET and the SETPOINTs' links to business and Higher Education allow us to provide teachers with appropriately trained, CRB-checked

Ambassadors who can act as role models and deliver exciting, novel demonstrations and project ideas.

At the same time, by providing this unique bridge between businesses and schools, SETNET and SETPOINTs can help employers gain a better understanding of the skills and attainment of young people, and the way in which their organisations can assist teachers.

Employers and individual Ambassadors tell us that they themselves gain from involvement with students and teachers – they further develop their confidence, presentational and managerial skills as well as, in some cases, igniting an interest in teaching as a career.

By the end of 2007 we aim to have expanded the SEAs Programme, from its current level of 12,000 to 18,000 volunteers. We will also be reviewing the training that all Ambassadors undergo to ensure it is of the highest standard and even better equips them to work with schools, particularly those which have not benefited before from dedicated STEM curriculum enrichment activities; the so-called "hard to reach schools".

As DfES's own review of science curriculum enrichment activities has shown, schools too often face a confusing plethora of choices, not all of which are properly linked to the curriculum or quality assured. This has led to many schools simply not taking advantage of any offerings.

SETNET is ideally placed to assist schools in making sense of this and is now playing a leading role in the establishment of the Regional STEM Support Centres, being developed to provide much more strategic and cohesive STEM approaches in the English Regions.

Pilot STEM Support Centres are being established in three of the English Regions – South East, Yorkshire and the Humber and London, each co-ordinated by the appropriate SETNET Regional Director. In each of these three regions, a number of key steps have been completed to allow the STEM Support Centre development.

A funding commitment has been given by the appropriate Regional Development Agency (RDA) (for 2 or 3 years) for the initial establishment of the Centre and core functions. After consultation with appropriate organisations, individuals and groups in the regions, initial Management or Advisory Boards have been formed or are in the process of being finalised for each Regional STEM Support Centre, each with a regionally influential Chair. In addition, a STEM Communication Manager has been appointed for each Centre to support development of processes and methods for communicating proactively with schools and colleges.

Early feedback in each of the Regions is highly positive with teachers, Local Authority Advisors and Inspectors, industrial contacts, STEM partners and others. All immediately identifying with the need for increased co-operation, coherence and clarity, STEM Support Centres are seen as a major development in meeting that need.

As Corinne Stevenson, a Senior Advisor Science at Hounslow Local Authority recently communicated to us: "Finally, a wonderful opportunity to ensure all pupils are excited and engaged and have access to science in the real world."

Regions which have not been involved in the pilot stage are keen to get on board as soon as possible, since partners such as the RDAs, industry, schools, Association of Science Educators (ASE) and others have communicated early the benefits already seen from the pilots.

SETNET and SETPOINTs are also committed to supporting those organisations whose key role is teacher Continual Professional Development (CPD). Significant work is currently taking place to build sustainable partnerships between SETNET, SETPOINTs, the Science Learning Centres, ASE, NAIGS and other CPD providers to create end-to-end experiences where teacher CPD, introduction to enhancement activities and further classroom support can be delivered in a seamless manner.

Through the new Regional STEM Support Centres SETNET will be working to encourage such collaboration as well as signposting appropriate opportunities to teachers and schools. We will also be encouraging SETPOINTs and other partners to work with the Science Learning Centres to develop courses that have business support and contexts which are attractive and relevant for teachers.

By working together to tackle the issue of supply in three compatible ways: firstly by ensuring more science teachers are subject trained and provided with consistent professional development; secondly by providing those teachers with relevant, inspiring and engaging STEM activities; and thirdly matching that activity with improved careers from STEM advice and information, we could turn the tide on numbers.

It requires many organisations, Government, business and industry to work together to support our science, technology, engineering and maths teachers so that we can demonstrate to our young people the real opportunities. We can not just say it is important to do science, we have actively to show them the benefits.

This is why SETNET will continue to speak with teachers, schools and other organisations to achieve greater awareness of the services and opportunities we provide in the STEM arena.

SETNET, 6th Floor, 10 Maltravers Street, London WC2R 3ER 020 7557 6422 www.setnet.org.uk

SCIENCE CITIES

Nurturing Knowledge Economies in the English Regions

Professor Christopher Edwards, Vice-Chancellor of Newcastle University.

Delegates from England's six "Science Cities" will gather in Newcastle upon Tyne for their third summit in February 2007 to discuss the progress being made in their efforts to generate science-based knowledge economies in the English regions.

Newcastle, Manchester, York, Nottingham, Bristol and Birmingham were designated as Science Cities almost two years ago by the Chancellor of the Exchequer, Gordon Brown, who recognised the need to develop sustainable knowledge economies outside London and the South East if the UK is to compete effectively in the global marketplace of the future.

Research-intensive universities are at the heart of the initiative. All six Science Cities are seeking new ways to harness the world-class technology and expertise possessed by their universities, to give companies a globally competitive edge and to spawn new industries. The idea that universities can catalyse regional economic development is not new, although the UK has been less successful at producing results than some other countries. One of the biggest problems has been that resources have been provided in discrete packages, by a multitude of agencies and funding initiatives, creating barriers which have been difficult to overcome.

The Science City initiative provides a more holistic approach, based on partnership between universities, government and industry. This "triple helix" model was largely developed by the American academic, Henry Etzkowitz, who is now advising Newcastle, having been appointed Professor of Management of Innovation at Newcastle University Business School.

Science and Innovation Minister Lord Sainsbury visits a "clean room" at Newcastle University, where nanotechnology devices are manufactured without fear of contamination by dust or other particles.

Regional Development Agencies are providing resources to pump-prime the Science Cities and are working with universities and other partners to develop the necessary infrastructure. The summit in Newcastle will provide Ministers with a progress report of the first two years of the Science City initiative, as well as allowing delegates to share ideas and discuss best practice.

There is a great deal of common ground between the six science cities, yet each has developed a distinctive approach, geared to its local needs. Newcastle is fortunate in that the regional development agency, One NorthEast, was first to recognise the crucial role higher education would play and as long ago as 1999 put universities at the heart of its regional economic strategy.

This visionary approach is now paying dividends. By the time Gordon Brown announced details of the Science City initiative in December 2004, the North East already had a number of relevant projects in place, including five "Centres of Excellence" bringing together industry and academic researchers in key areas. One NorthEast had also established excellent relationships with the region's five universities; Newcastle, Durham, Northumbria, Sunderland and Teesside.

Newcastle was therefore able to move quickly to seize opportunities. When a 22 acre site became available in the commercial heart of the city in 2005, as a result of a

major employer relocating to new premises, the majority of the site was purchased for £33m by a partnership of One NorthEast, Newcastle City Council and Newcastle University, with a view to redeveloping it as the "hub" of Science City. The partnership has ambitious plans to develop this site with public and private money and envisages that some of the region's best scientists will work there, alongside research and development teams from leading companies.

Newcastle University Business School will play an important role, building bridges between the partnership and the private sector, and has recently announced that it is creating new headquarters close to the hub. The partnership also has the benefit of advice from the business software company Sage PLC, one of Newcastle's most successful and progressive businesses, whose Chief Executive, Paul Walker, chairs the science city leadership group.

As the hub of Newcastle Science City develops, it will form relationships with existing research centres in the city, including the Centre for Life, the Campus for Ageing and Vitality and, of course, the University itself.

The Centre for Life is perhaps best known as the home of stem cell research in Newcastle. This unique facility was a Millennium Project and can be regarded as a pilot for Science City, since it has brought together researchers from Newcastle and Durham Universities, clinicians from the Newcastle NHS Foundation Hospitals Trust and biotechnology businesses, to work together in new and innovative ways.

The University's Campus for Ageing and Vitality, located at Newcastle General Hospital, is modelled along similar lines. It has grown into one of Europe's largest groups of researchers and clinicians specialising in old age medicine and has forged links with the private sector, including a major global company operating in this area.

Newcastle University campus is central to the city geographically as well as economically. With 4,600 staff and over 17,000 students, the University has helped hundreds of companies develop products and processes through research, consultancy and postgraduate student placements. The process is encouraged via outreach organisations such as Knowledge House, which provides a one-stop shop for companies seeking access to university technology and expertise. More recently, the University has established the Stephenson Centre to work with businesses in various engineering disciplines.

This atomic force microscope is among Newcastle University's impressive array of research facilities which enables it to work with high-tech companies.

Clearly, Science City is an extension of an ongoing process. Newcastle and the North East have in fact been listening to Society and meeting its needs for centuries; by developing steam power, railways and electric light; designing better housing, opening the world's first department store and introducing the first water fluoridation system, to name a few innovations which have changed the world.

The entrepreneurs who forged the region's powerhouse economy in the 19th century recognised the importance of advances in technology and skills to sustain key industries and helped to establish the colleges which were the fore-runners of Newcastle University. While these traditional industries have all but disappeared, the ethos of applied research and vocational teaching survives in the University to this day.

As Vice-Chancellor of Newcastle University, I have pledged that the University will "transform" in order to deliver on the Science City agenda. We will develop better ways of working with businesses, attracting more and bigger companies and other organisations to work with us, and creating the right conditions for University spin-out companies to grow larger, sowing the seeds of future industries.

We are crossing other boundaries, too, since we recognise that it is not possible to create a knowledge economy on science alone and that we must engage Society at all levels. For example we are forging links with schools and colleges through our education workstream and will in future contribute to the science curriculum and raise aspirations. Education is already a key theme at the Centre for Life, which has enthused thousands of local youngsters about human genes and DNA, as a result of school visits to its Lifelab centre. The University campus also attracts thousands of young visitors each year to its open days, museums and public lectures. Engagement with young people is regarded as particularly important because we are sowing the seeds of the next generation of scientists and skilled employees. Our Science City will therefore be sustainable.

We have also decided that Newcastle's geographical boundaries should not be barriers and we are extending the principles of science city to the "city region" of North East England. This is allowing us to engage with more key businesses, for example the chemicals industries on Teesside, as well as benefiting from our partnerships with the region's other universities, such as Durham in stem cell research.

The Science Cities initiative is moving forward quickly and I am sure that all six designated cities will be able to demonstrate significant progress at the forthcoming summit. It is essential that the momentum is kept up — and not just for the benefit of the six Science Cities. The fact is that all of the UK's cities, towns and regions will be vulnerable if the UK fails to respond adequately to competition from emerging countries such as China, India and Brazil.

The Royal Academy of Engineering MacRobert Award

The Royal Academy of Engineering MacRobert Award is the UK's premier prize for engineering and is given annually for an outstanding innovation of benefit to the community. The 2006 Award winner was Optos plc for the innovation of ultra-wide field retinal imaging

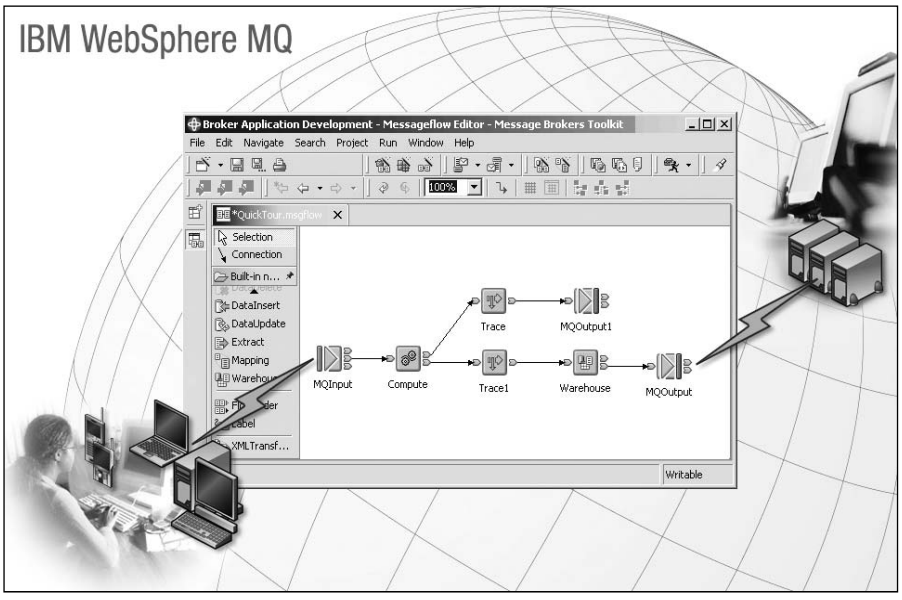
Described at its launch as "the Nobel Prize for engineering", the Award was founded by The MacRobert Trust and first presented in 1969. Since 1976 the award has been presented by The Royal Academy of Engineering, a prize fund having been established with donations from The MacRobert Trust, the Academy and British industry. It honours the winning company with a gold medal and the team members with a prize of £50,000, presented at The Royal Academy of Engineering Awards Dinner in June. Individual medals are then presented to each team member by HRH The Duke of Edinburgh at a ceremony in Buckingham Palace. There is also the opportunity for the winning team to stage a display at the Science Museum in London.

There are usually between 30 and 50 submissions for the Award each year which are reviewed by a panel of judges drawn from all areas of engineering, each bringing their own expertise to the task. A shortlist of companies are visited by panel members leading to the selection of no more than four finalists. Each finalist then receives a visit from the entire panel of judges before the overall winner is selected.

While competition is intense and the judging process both lengthy and rigorous, the rewards are many. In addition to the gold medal and prize money, one of the major benefits of the MacRobert Award is the public recognition that it brings. The winner becomes a role model, and a vehicle for publicising the achievements of British engineers. This recognition can also provide a major morale boost for many companies, motivating them to make further innovations and developments. It can strengthen a company's ability to encourage and motivate younger team members and helps to convince students and young people coming through the educational system to choose engineering as a career.

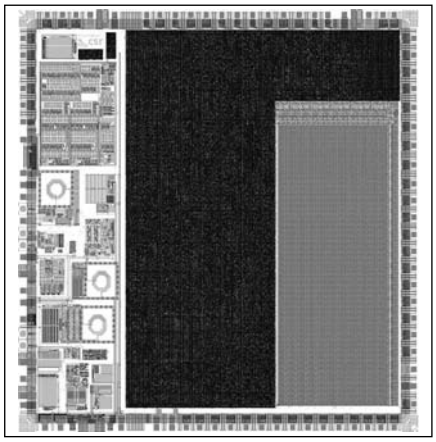
The MacRobert Award was devised with the specific objective of rewarding the very best innovation in engineering in any year, it being understood that successful innovation can take several years to bring about. The award would be open to individuals or teams (of up to five people) from any size of company or institution. From the outset, it was recognised that in order to meet this goal the Award would have to transcend traditional boundaries – sectors, disciplines and so on. In addition, whilst many past winners of The MacRobert Award have been for engineering innovation in the area of products, it was acknowledged that systems, processes, structures and software were equally eligible. All fall within the boundaries of engineering, making the Award a true manifestation of what The Royal Academy of Engineering is all about – the pursuit and promotion of excellence in engineering.

This multidisciplinary approach has been well demonstrated in recent years. In 2004, IBM UK Laboratories won the award for the WebSphere MQ family of software products. The products provide a failsafe means of exchanging business-critical information between computer systems, irrespective of their location and regardless of the hardware, programming language, operating system or communication protocol. Launched in 1994, it took ten years to establish. When IBM received the MacRobert Award in 2004, the Vice President, Graham Spittle had the following comments to make; "We are delighted that the IBM Websphere software family has been honoured with this prestigious award by The Royal Academy of Engineering… the award recognises the importance of software as an engineering discipline in its own right, as much as it recognises the success of WebSphere MQ. The MacRobert Award indicates the maturity of the industry and recognises the significance of the role IT plays in the modern world."



IBM's WebSphere MQ software © IBM

The success of IBM in 2004 was followed by CSR plc in 2005. CSR were responsible for the design and introduction of the single chip radio, BlueCore™00 – commonly known as Bluetooth. As the first company to place a radio transmitter and receiver, microprocessor and memory on a single chip of silicon, CSR were able to exploit a totally new market opportunity and as a result became a global success story. The Award recognised not only their innovation and commercial success but also the fact that they had gathered together some of the best engineers to develop it – including nearly 300 people at their research headquarters in Cambridge. CSR had captured the aims of the award perfectly – seeking, seizing and securing commercial opportunities through outstanding engineering innovation.



CSR's single chip device, BlueCore™ © CSR plc

The judging panel has always been adamant that the size of a company should not be an influencing factor in their choice of winner. Previous MacRobert awardees have included well known names and large companies such as Rolls-Royce plc (for the Trent aero-engine), BP International (for advancing the application of hydraulic fracturing technology used in the exploitation of oil and gas reserves), and Johnson Matthey plc (for the Continuously Regenerating Trap to control diesel pollution). However, smaller companies have been equally successful over the years. Employing only 120 members of staff, Cambridge Display Technology won the award in 2002 for its Light Emitting Polymers for Display Applications. This enabled flat screen televisions and computers to give as good a picture as the cathode ray tubes in conventional televisions, without the bulk or complexity. The 2006 MacRobert finalists inspired comparisons with "David and Goliath" – amongst the four companies competing for the prize were Airbus UK, who employ 13,000 members of staff, alongside a tiny spinout from the University of Aberdeen, Brinker Technology, who employ 13 staff members!

In the event neither Airbus nor Brinker won the 2006 MacRobert Award. The honour went to Optos plc, a company that has revolutionised eye care and the early detection of retinal defects with its ultra wide retinal imagers. Optos was founded in 1992 by Douglas Anderson after his then 5 year old son lost sight in one eye due to retinal detachment being diagnosed too late, despite regular eye examinations. Routine retinal examination methods provide only a limited narrow-field view of the retina – typically less than five per cent in a single capture. The limitations of these methods spurred Anderson to go on to oversee the development and commercialisation of a unique non-invasive imager which, in quarter of a second, captures a high resolution digital image of over 80 per cent of the retina. Such vastly increased performance has significantly reduced the risk of missing early signs of eye diseases, as well as indicators of other non-eye related diseases such as diabetes, hypertension and certain cancers, which are often first exhibited in the retina.

Optos now have over 200 imaging devices installed in eye and health care practices in the UK, Germany, USA and Canada, and have conducted over 8 million patient examinations to date. "We work hard to save sight and save lives; that is what it's always been about," says Global Product Director, Alastair Atkinson. "We are extremely proud of what we've achieved so far; not only in terms of the technology but also in terms of how we strive to make our innovations available in the most cost-effective way we can for our customers. To have the value of our technology and our contribution to society recognised by such an esteemed organisation as The Royal Academy of Engineering and its MacRobert Award means a great deal to us."

The 2006 MacRobert Award winning team – Executive Vice-Chairman, Douglas Anderson, Chief Technology Officer, David Cairns, and Alastair Atkinson – were presented with the MacRobert Award Gold Medal by the Duke of Kent on 5 June at the Academy Awards Dinner. On 16 June the team attended a private ceremony at Buckingham Palace where they were presented with their individual medals and prize money by the Academy's senior Fellow, HRH The Duke of Edinburgh.

David Cairns, Alastair Atkinson and Douglas Anderson receive their MacRobert Award Medals at Buckingham Palace

For further information regarding the MacRobert Award, or to make a submission, please contact Clare Huddlestone at The Royal Academy of Engineering or visit the Academy website at www.raeng.org.uk

Submission forms for the 2007 MacRobert Award will be available from October 2006 and must be received no later than 31 January 2007.

Research Finds Masonry Homes Can Have Lowest Whole Life CO_2 Impact

New research by independent consulting engineer Arup shows that when it comes to reducing the operational CO_2 emissions the utilisation of thermal mass is paramount. Andrew Minson, Head of Framed Buildings at The Concrete Centre, explains

Over the life of a home, the operational CO_2 emissions have far more environmental impact than the embodied CO_2 of the materials used to build it. Some 50% of the UK's carbon emissions are due to the energy used to heat, cool and light buildings. It is essential, therefore, that the energy which is likely to be consumed during a building's lifecycle is taken into account when evaluating construction materials. A building's environmental impact does not stop once it has been built.

New research from Arup Research + Development shows that modern masonry houses that take advantage of their inherent thermal mass of concrete can save a significant amount of energy over their lifetime compared to lightweight timber frame housing. The research is the most comprehensive study to date to examine both embodied and operational CO_2 emissions from dwellings in a warming climate. It provides strong evidence that lightweight timber homes may not be as comfortable or as sustainable in the long term as heavyweight masonry construction.

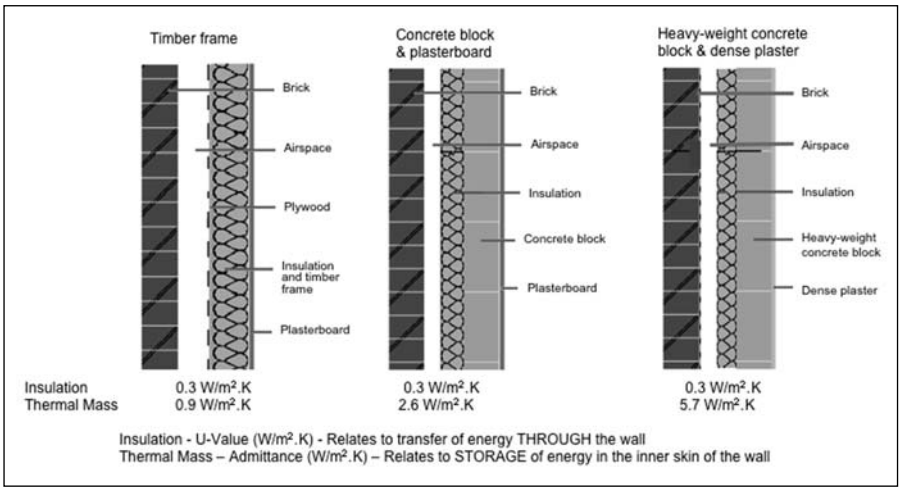
The research takes account of experts' predictions for climate change and demonstrates that the thermal mass in masonry homes can reduce the likely need for air conditioning in the coming years. It also highlights the additional savings that can be achieved by using thermal mass to capture solar and internal gains thereby reducing the consumption of fuel during the heating season. These savings can offset the slightly higher level of embodied CO_2 in a masonry house in as little as 11 years and can ultimately lead to the lowest CO_2 emissions over the life of the house

The research compares lightweight timber homes with medium weight and heavyweight masonry homes and found that the latter can have the lowest total energy consumption and CO_2 emissions over their life. This was achieved through using the thermal mass in blockwork internal walls. It was also found that the addition of concrete floors increased the operational CO_2 savings still further over the life of the house. Beyond this, additional increases in thermal mass are beneficial but the offset period obviously becomes longer.

Lightweight homes were found to overheat more frequently during the predicted hotter summers of the 21st century which could in turn lead to an increase in the use of air conditioning resulting in greater energy use and CO_2 emissions. Homes built using heavyweight construction materials with their inherent thermal mass will be cooler in the summer and so will not suffer overheating to such a degree.

The energy savings are not restricted to eliminating the need for air conditioning. Thermal mass can also be used to capture solar and internal gains during the heating season and re-radiate the heat into the room as the temperature begins to fall in the late afternoon. Otherwise known as passive solar design, this energy saving technique is very simple and basically requires little more than glazing that is orientated to the south and adequate thermal mass in the floors and/or walls to capture and store heat from the low winter sun. It is applicable to standard house designs and its ability to reduce the load on conventional heating systems enables worthwhile savings in heating fuel and CO_2 emissions to be realised over the life of a house. Straightforward guidance on passive solar design (PSD) is available to download from the Carbon Trust website, www.thecarbontrust.co.uk

Tom de Saulles, Senior Manager for Building Sustainability for the British Cement Association, explains that the research was based on the



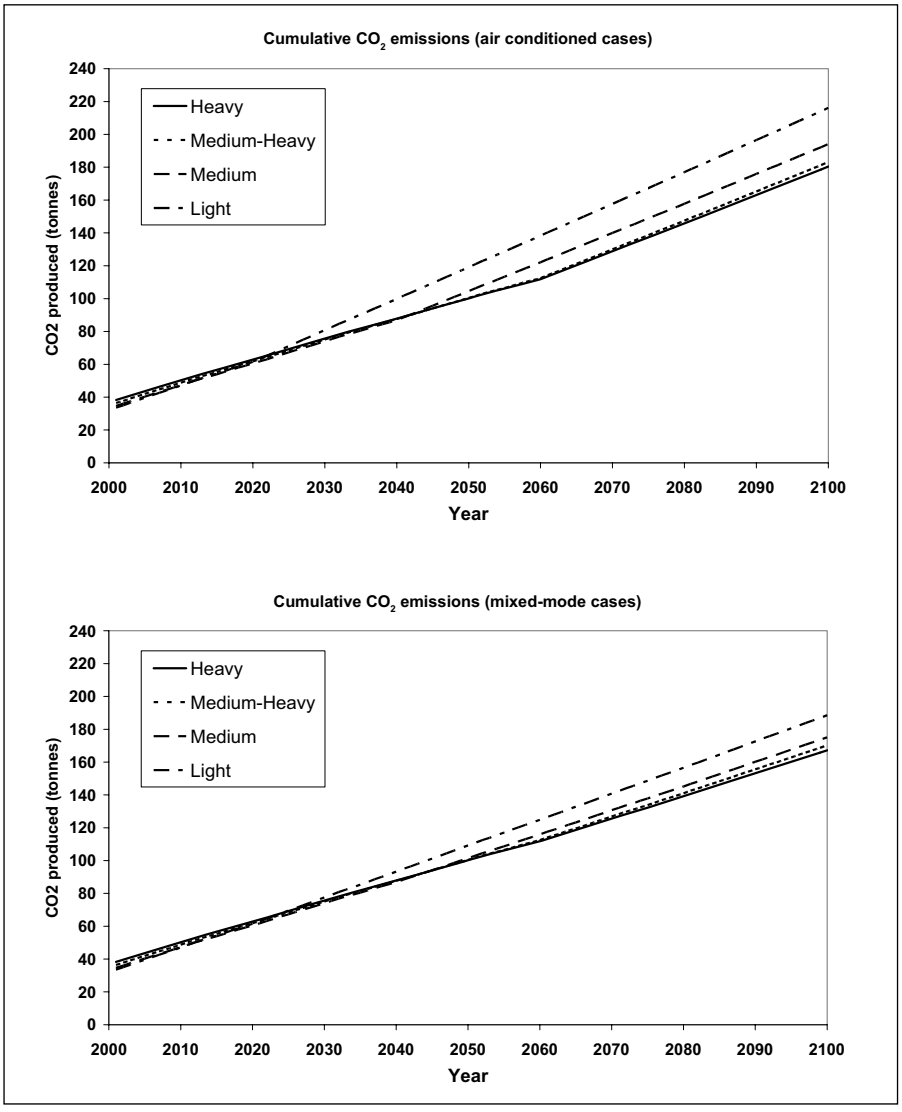
study of a two-bedroom semi-detached house in the south east of England, typical of the type of "starter home" envisaged by the Government for major areas of housing development such as the Thames Gateway. Analysis of lifecycle CO_2 emissions was carried out on four "weights" of construction: light, medium, medium-heavy and heavy. The lightweight class was a timber-frame home with timber floors, exterior brick and internal plasterboard finish. Medium weight was the same but with brick and block cavity walls. The medium-heavyweight house had a pre-cast concrete first floor and ground floor partitions of medium-weight concrete blocks with a plasterboard finish. Finally, the heavyweight house had the highest level of thermal mass with heavyweight blocks used for the external walls and internal partitions, together with a pre-cast concrete first floor and loft floor.

Occupancy was assumed to be continuous, with a family of two adults, one of whom was at home during the day with a pre-school age child. In all house types, gas-fired central heating with radiators was assumed and had a set point of 19ºC for the bedrooms, 21ºC for the living room and 22ºC for the bathroom. In the summer, three operating modes were considered: natural ventilation, conventional air conditioning and mixed-mode, which was air conditioning combined with natural ventilation so the benefits of passive cooling are realised whenever possible. In line with guidance from the Chartered Institution of Building Services Engineers (CIBSE), a house was judged to have overheated if 1% of the occupied hours in the living room were over 28ºC or 26ºC in one or more of the bedrooms. The research also included the caveat that this must occur in at least 3 in 5 consecutive years before it was assumed that air conditioning would be installed. From the outset, all the houses had solar shading and an appropriate ventilation strategy to help mitigate the effects of climate change.

Weather data representative of the climate of suburban London was used as the basis of the lifecycle analysis. The data covered the 20-year period (1976-1995) and was repeated in sequence to cover the 100-year period of 1996-2100. This was then modified using a continuously ramped morphing factor which takes account of the UKCIP02 medium-high emission scenario for climate change in the 21st century.

The lightweight home was found to need air conditioning by 2021. This compared to 2041 for the medium-weight home and 2061 for the medium-heavy and heavyweight homes.

The better winter performance due to PSD of the masonry house was found to negate its marginally higher level of embodied CO_2 compared with the lightweight house in just 11 years. The medium-weight masonry home was calculated to have around 1.25 tonnes more embodied CO_2 than the equivalent timber house, yet over a 60-year period the timber framed home was found to emit 9 to 15 tonnes more CO_2. Whilst recognising that there are many variables that can influence thermal performance, the research highlights the ability of masonry and concrete construction to provide the best long-term sustainable building option through energy efficient design.



For more information see www.concretecentre.com/greenhomes

An assessment of the state of the UK's infrastructure by the Institution of Civil Engineers

Quentin Leiper, ICE Senior Vice-President

The 2006 ICE State of the Nation report, launched on Tuesday 17 October, is the annual examination of the UK's infrastructure. It is compiled each year by a panel of experts drawn from the various fields of expertise across ICE's membership and the report features material from across ICE's UK regions.

Some of the key findings of this year's report include:

Water and wastewater

Water services in the UK generally continue to be excellent. However, the drought of 2006 is showing that, in some parts of the country, our existing water supplies are only just adequate for current demands. With rising demand, cutbacks in existing supplies and the threat of climate change, the need for increased water provision is becoming more urgent.

Economically-justified investment in infrastructure is vital to keep our water supply topped up. The appropriate mix of resource solutions and demand management should be maintained. This must include planning new reservoirs, stepping up the replacement of old, leaky mains, recycling sewage effluent (a measure we have hitherto only paid lip service to) and developing desalination plants to treat brackish water in times of supply shortages. Inevitably, water prices will have to rise to fund the investment – an uncomfortable fact that Government, regulators and customers must recognise.

Energy

In 2005, energy consumption rose, fuel prices shot up and domestic production fell.

The July 2006 report from the Government's Energy Review recognises the need for simpler planning and regulatory processes for new energy projects, and the need to give greater encouragement to the public to make energy efficiency part of their daily lives. It also recommends maintaining the mix of fuel sources in order to sustain or improve our security of supply. However, more consultations and reports are inevitable before the strategy is implemented.

Waste management

We should move away from using the phrase "waste management". "Material resources and waste management" describes today's industry more accurately and could help to eradicate the image of landfill mountains and flocks of scavenging seagulls.

Changes in terminology can change perceptions; what has to follow are real efforts by the industry, Government and the public to put this new emphasis to work. We must aim for a situation in which the majority of materials that have traditionally entered landfill are entering a cycle of reuse. To meet its targets the UK will require 1,700 new facilities of a range of sizes to be up and running by 2012, at a cost of some £10 billion.

Flood management

Over the three years to March 2006, improved protection had been provided to 100,000 more properties. There are also now 200,000 people on the Flood Warning Direct service, with 113,000 new users in England and Wales. Flood-risk management has become more strategic and sustainable.

However, over 4.5 million people, 2.3 million homes and 1.7 million hectares of land remain at risk from flooding in the UK. And studies by the Environment Agency report that 5% of the country's 30,000km of flood defences are in a poor condition. At the same time the potential cost of floods, in human and financial terms, is increasing.

Rail

Nine out of ten British trains arrive on time. However, in England especially, the rail network is at full stretch. We need a long-term national strategy to move passengers and freight in comfort and on time.

In England the future investment programme is weighted towards London and there is a danger that major projects will soak up funding and human resources, leaving only the opportunity of minor tweaking of the rail infrastructure elsewhere. It is encouraging that Network Rail has set up a strategy group to look at the human resources issue, and its £400 million discretionary fund will allow vital minor improvements to the network over the next three years.

Roads

Congestion isn't just an inconvenience; it's a millstone around the country's neck. Hold-ups on our motorways and trunk roads cost the economy £15 billion every year. Measures in place now, such as the Traffic Officer Scheme and the installation of real-time information displays, are designed to cope with congestion, not reduce vehicle use. For this, the most effective policy would be for the Government to take a lead on road user charging. Progress on demand management has been far slower than expected. We need to start seeing more pilot schemes and the development of a national system of charging. Roads are the cheapest form of transport; they are also an undervalued resource.

Local transport

Over the last six years bus use in the UK has risen steadily after many years of decline. Scratch the surface, however, and the story isn't so cheery. The increase is almost entirely the sole achievement of the capital, where a franchise system, allowing Transport for London to control bus routes, frequencies and fares, has delivered a 55% increase in bus use since 1985-86. Outside London bus services are still fully deregulated and the same period has seen huge falls in bus use.

If this trend is allowed to continue, congestion will worsen, transport will become less accessible, and the implications for regeneration and urban development will be serious.

Airports

In spite of security scares, a rise in oil prices and a softening of the UK economy, passenger traffic at London's airports still grew by 4%. At regional airports traffic grew by 9% for the second year running.

Airports throughout the country have ambitions for an unprecedented period of expansion. But even with changes to the planning system, getting planning approvals will be difficult. Already, the legal basis of airports' expansion plans has been challenged in the courts. There is also the challenge of improving the transport infrastructures that serve airports. Road and rail connections need to be upgraded in a co-ordinated, strategic way by the relevant authorities.

Seaports

Ports are vital to our economy and could do more to move freight

efficiently around the country, yet their further development is in question. Port developers here cannot absorb the cost of major off-site works. But to remain competitive with continental European ports, whose development is often supported by regional governments, they cannot afford to remain the size they are. The Government must recognise ports as a vital organ in the national economy and fund the infrastructure that will help to keep them healthy.

Conclusion

It is now time that we started answering the questions posed in this year's report:

How do we intend to reconcile rising demand for water with dwindling resources?

Where is our electricity going to come from in the future?

How can we stop our rubbish piling up on landfill sites?

How do we tackle congestion on our roads and railways

To read the complete report please visit uk-infrastructure.org.uk

For more information about ICE or the report, you can contact the ICE External Relations team on 020 7665 2265.

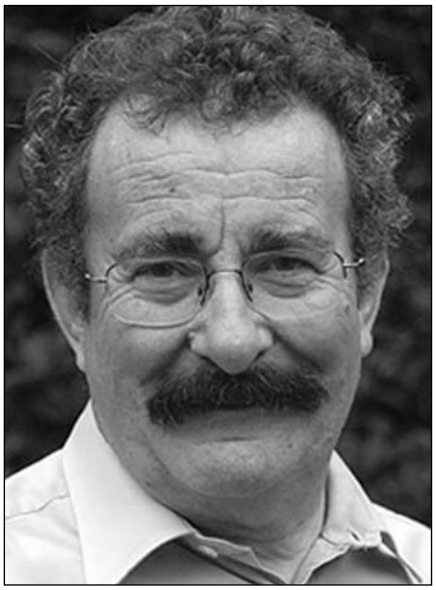
About ICE

The Institution of Civil Engineers (ICE) is a leading source of professional expertise in transport, water supply and treatment, flood management, waste and energy. ICE is a global membership organisation that promotes and advances civil engineering around the world. Established in 1818, it has around 80,000 members throughout the world – including over 60,000 in the UK

MEETING OF THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE ON MONDAY 19TH JUNE 2006

The Human Fertilisation and Embryology Authority (HFEA) has recently been criticised for the imposition of unnecessary and bureaucratic restrictions on the development of scientific advances in human reproductive technologies in the UK while at the same time failing to provide effective regulation of some of the more commercial aspects of the business of aided human reproduction. Hence the question has arisen as to whether there is still need for regulation of this branch of medical practice by the HFEA in the UK and if so how this should be modified to respond to the need to encourage and promote scientific advances in the future while managing the negative aspects better. For example, about half of the multiple pregnancies in Britain, with all the related additional financial and healthcare burdens borne mainly by the NHS, are attributable to the work of fertility clinics that are still able to generate twin births unrestricted by the HFEA.

Regulation by the Human Fertilisation and Embryology Authority isn't Working



The Lord Winston, House of Lords

There is one area that Peter Braude and I agree about, but otherwise I wish to suggest to you that the mechanism for regulation in the UK is totally unsatisfactory. In my view the Human Fertilisation and Embryology Authority (HFEA) that regulates clinical work and research in this country is unnecessary and is inhibiting work. This has reached the stage where many of the advantages, had we not had a regulatory authority, have passed us by. I should emphasise that I have never been a member of the HFEA and neither would I have chosen it had I been asked.

There are two areas that the HFEA is responsible for, the first is clinical work involving gametes which are donated or stored, and embryos which are for use by in vitro fertilisation (IVF). It is not for infertility, which is mostly unregulated; that is the first anomaly. It is perfectly possible in this country to transfer any number of eggs to the fallopian tube by means of GIFT (Gamete IntraFallopian Transfer) and enjoy multiple pregnancies thereafter. That is not regulated. So is it justifiable to single out one branch of medical practice for regulation? I think there is possibly no justification. There are many other areas which may damage small, or as yet unborn children which are not regulated and no particular suffering results in consequence. This is true of neonatal paediatrics and obstetrics practice and other areas of medicine where there is equal risk of damage to babies and children. So why single out the embryo for special regulation in clinical practice?

The second issue is how practice is actually regulated. That was one area where I think Peter Braude and I undoubtedly agree. He will show you figures that support his view and I agree with them. About half the multiple pregnancies in Britain are generated through IVF techniques. They are a colossal burden on the patients, on the babies, and on the health service. There does need to be some mechanism by which we can prevent multiple births which must mean avoidance of multiple embryo transfer. But beyond that I cannot think of any other regulatory justification for this Authority. What has happened in consequence of this special regulation is that IVF is seen to be disreputable, dangerous, outside medicine in general. That has certainly damaged it. It is not funded in general through the NHS, because it is seen to be disreputable treatment, and in consequence out of the 30,000 women who will be treated this year, perhaps only 5,000 will get treatment under the NHS. Every excuse is constantly used not to include this treatment in the NHS. If it were, of course, then we would have a totally different mechanism of governance. At the present time it is subject to all sorts of curious practices which

are dubious, and impossible to control. For example, the HFEA has hardly managed to control private practice at all. There is gross exploitation of patients, an example is seen with overcharging. Where things cannot be done by approval by the HFEA, there is clear evidence that patients are going overseas; moreover, they are often going overseas not merely with the blessing of a clinic but actually by arrangement by that clinic. There are a number of practitioners in London who have monetary arrangements with clinics overseas. Some of you who read The Observer will remember the story of Svetlana in Kiev who was hyperstimulated five times, who received only US$300, while patients paid £3,000 a treatment for her eggs. Some of those patients were almost certainly British.

The practice of pre-implantation genetic diagnosis is an example where the HFEA has gone to great lengths to regulate. It is a curious situation whereby every mutation which is being tested for has to have approval by the HFEA. Yet, patients can get a termination for pregnancy in this country perfectly legally and without controversy for any serious or life-threatening mutation without regulatory recourse. Abortion is clearly a much more grave decision, but pre-implantation diagnosis cannot be done without lengthy regulatory approval to select the embryos which are genuinely believed to be free of serious health defect.

There are numerous examples of where the HFEA has taken a thoroughly bad decision. Let us take one example, such as the area of egg donation where payment of donors is not allowed. On reflection it might be better if it was. What, of course, the HFEA does allow actually is the payment of egg donors. It allows up to £3,000 of payment in kind by the process of egg sharing. A woman who cannot pay for her treatment can go to a private clinic and can get IVF as she effectively pays for it by giving some of her eggs. She may not get pregnant from her own treatment but the other patient who has received her eggs does. Now with the loss of anonymity of donors, there is this shocking scenario which means that, in eighteen years time, a woman who never got pregnant as a result of her own treatment may find that she has a child tracing her who she never knew that she had as a result of egg sharing. Oddly, the HFEA has connived at this process.

On the clinical side, let me mention two other matters, one is the use of league tables. I find it astounding that just in the last few weeks the HFEA has again published league tables showing one clinic getting a 54% pregnancy rate, and with another one getting about 48%, and some other clinics getting about 20% pregnancy rates. Now what a regulatory authority should be doing surely if it is going to have any clout at all is to ask the question "Why is this clinic so much more successful than everyone else?" The evidence is that some of the clinics that are very successful are doing all sorts of things with the mechanism of recording which actually gives a false impression of their success. For example, sometimes treatment is recorded as a drug trial and the results subsequently excluded when patients do not respond to those drugs. Alternatively patients who may not have a very good chance of a pregnancy may be referred to another clinic.

The argument for the HFEA, of course, in its present form is that it promotes public trust. The idea, of course, is that without the HFEA this treatment would be seen as being more damaging and dangerous and not in the public interest. But the social science research to demonstrate whether this opinion is true has never been done. In fact one of the problems with the HFEA is that it has never in its consultation process got things right. Does it really do effective consultation with the public? It just set up a website, and it could well be that regulatory authorities like this actually increase public distrust, not decrease it, by raising unnecessary concerns.

On the research side there is not a single justification for the HFEA. Researchers have to put through a research application to the authority having already received ethical approval. So this leads to a doubling up of the research approvals process. It delays research. In my most recent application to do stem cell research on testicular cells, by the time I had got the licence for the work that I wanted to do, it had already been published in Nature by another group.

The HFEA still maintain that they are a model for the Universe, that they are the ideal paradigm which other countries follow, but I think I am right in saying that of the larger countries only Canada has followed this model. No other country has done so and no European country has done so. And they are right not to do so because it isn't a sensible way of regulating research. Take the issue of embryonic stem cells, for example, the great pride of our biological science. A search through PubMed reveals that there are several hundred papers published on embryonic stem cells from the United States of America where, of course, President Bush has banned public funding for embryonic stem cell research. In Britain at my last count, from the 14 clinics licensed in the United Kingdom, there were a total of 17 peer reviewed publications in the literature, of which 13 come from just two units, Cambridge and Newcastle.

So far from promoting research, the evidence is that the HFEA is actually inhibiting it and delaying it and it is a serious worry at a time when academic medicine is so much under threat that we have this arcane and archaic method of regulation of research. There is no question that people cannot do illegal experiments. Cloning is a criminal offence. There are a number of issues which are clearly defined in the Statute Books, which do not need the HFEA to regulate. So my proposition is that if we are going to review the Act of Parliament, we need to review it very thoroughly indeed and consider whether or not this method of regulation is sensible.

Do we still require regulation and what still needs regulating?

Professor Peter Braude,
Head of Department of Women's Health, King's College London.

Four key reasons for establishing the Human Fertilisation and Embryology Authority were:

- to protect patients and their offspring by monitoring the safety and efficacy of a new therapeutic technique
- to allay public concerns about the creation and manipulation of human embryos by erecting barriers and having visible regulation
- to protect scientific freedom by reassuring the public that the work was subject to monitoring and proper control, and
- to protect those working in the field from criticism and claims of unethical behaviour.

On balance the HFEA is and has been a successful regulator that has fostered confidence from the public that clinics are being monitored and embryo research is being policed. There is less confidence from the profession where some aspects of practice have been made turgid by having to comply with obsolete requirements of an inflexible Act. Although the Act has served well for the past 15 years, it is timely that it is being revised.

What no longer needs regulating

Confidentiality: To the public and the profession, IVF has become mainstream fertility therapy, and the draconian provisions to protect information (even from other doctors as it was initially constructed) is no longer appropriate. Such confidentiality has been destructive in that it has prevented the linking of information through other medical databases, such that epidemiological information and safety of IVF cannot be examined. Substantial effort is wasted by clinics in trying to deal with this requirement, and significant time is apportioned during inspection processes to examine compliance. Adverse incident reporting that arises from defaulting the process is unnecessarily bureaucratic.

"Welfare of the Child" provisions: Concern for any child, even for those not yet born, is part of good medical practice. Specific legislation is unnecessary and simply frustrates clinics. The application as part of good practice should be extended to all parts of fertility treatment, where concerns should be acted upon. The requirement has promoted the inclusion of counsellors into IVF practice, but their need is wider than the law requires.

Anomalies

Training in embryo manipulation techniques: The strict terms for protection of the embryo – treatment, storage and research licences – means that there can be no training in how to biopsy (remove a cell for testing) outside of a licensed research project. Licences for embryo biopsy are not granted until a certain number of procedures have been undertaken. Where clinics do not perform research but may be good at therapy, there is no means by which practitioners can learn the skills of biopsy to satisfy the regulations needed to become a licensed practitioner.

Length of cryostorage and research: Embryos may be stored frozen for 5 years, and that may be extended for a further 5 years if there is clinical need. The 5-year initial restriction has created problems; it can only be extended if there are reasonable grounds to expect the patient's reproductive ability to be permanently impaired. In practice it is rare for this not to be able to be argued and hence it is simply an additional bureaucratic step. In addition, should the 5 years be up, the law as stands does not allow extension of storage if the embryos are to be donated and stored subsequently for research. This restricts the use of a valuable resource for stem cell research amongst others.

Blunt instrument for sanctions: The only recourse that the HFEA has to non-compliance is removal of a treatment licence, or referral to the DPP if the law has been breached significantly. These extraordinary measures have only been used a couple of times, and if implemented have significant implications for patients in, or waiting for treatment at, that clinic. Simpler strong medicine which would have direct effects on the owners or practitioners in the clinic (fines, suspension, name and shame) is required for repeated or serious misdemeanours.

Future Challenges – The continuing need for regulation

Dealing robustly to ensure patient safety: Multiple pregnancy is a significant problem in assisted reproduction. Triplets were a constant feature of IVF treatment in UK until early 2000, whereupon the HFEA encouraged practitioners to replace no more than two embryos at a time. Although many complied, the financial imperative and competitive drive for commercial clinics to have the highest pregnancy rates meant that a number continued with a high triplet rate. The imposition of mandatory regulations of two only has halved the triplet rate in this country and saved many damaged children and saved considerable money in the NHS. However the problem of twins still needs addressing. Although the residual triplet rate will include those that result from natural forces, the rest derive from other unregulated forms of fertility treatment. Absence of regulation with teeth will simply allow the problem to persist.

Stem cells: The process of developing stem cells from the ***in vitro*** cultured human embryo requires extended culture in the laboratory. Although in most cases the tissue destined to become placenta is separated from the ***in vitro*** embryo at an early stage (5-6 days) rendering it incapable of implantation and thus strictly no longer an embryo, it has been reported in the literature that day 4 or day 5 embryos cultured whole, may be more reliable for stem cell generation. Although the structure of these embryos changes during the culture, such that we believe they are incapable of further development in a womb, they may have to be cultured for more than two weeks before they show the clear appearance of stem cell formation. Would this be in breach of the HFE Act 14-day rule despite non-appearance of the "primitive streak" or semblance of normal embryonic formation? Clarity in this area of the Act may be required.

Therapeutic and reproductive cloning: It is clear that one possible way forward in the pursuit of stem cells useful in therapy and research would be to develop embryos from eggs that have had their genetic material removed and replaced by a nucleus from a somatic cell from a specific individual in order to produce a "tailor made" stem cell line. Although the process may be viewed as similar to reproductive cloning, the intention of the process is entirely different. But relevant law does not include purpose. We now have legislation to forbid the process for reproductive purposes, but for patients with inherited mitochondrial disease, in whom the defect resides in the cytosol of the egg, the only way forward to avoid the disorder being inherited in the child, would be to utilise a donated egg and have their own genetic material (nucleus) substituted – akin to reproductive cloning but for medical reasons. How will our legislation deal with this very real medical need?

Stem cells that become gametes: As in normal development of sperm and eggs from body cells, it seems increasingly possible that these gametes could be derived from stem cells. The creation of sperm or eggs in the laboratory is of real scientific interest in the study of cellular processes, but also could be used to generate a new embryo theoretically capable of implantation and development. Although fertilisation of these gametes ***in vitro*** would be covered by the Act, the use in a Gamete IntraFallopian Transfer (GIFT), a procedure where sperm and eggs are placed in the fallopian tube, is not. This anomaly demonstrates the need for a flexible approach to frequent revolutionary scientific developments. It also demonstrates the need for a regulatory body, which is conversant with, and has sufficient specialist understanding of the nuances of new developments in reproductive medicine and biology. The intention to merge the HFEA within the Human Tissue Authority in order to create a new broader Regulatory Authority for Tissues and Embryos "with a substantial lay representation", simply as a political expedient to reduce the number of NDPBs is a significant concern.

In discussion the following points were made:

An article from New Scientist was quoted where it was viewed that "an embryo in a dish has as much chance of becoming a human being as a dish of diced carrots" as its future depends on intention; if it is in a dish it is not going anywhere, if it is in a uterus, that is a different story. Discussion about the faith view centres on when the soul enters the fertilised egg. The possibility of generating two cleaving embryos in the laboratory by splitting an earlier stage (eg an eight-cell embryo into two four-cell embryos) begs the question as to whether two individuals have been created with two souls. If this is then followed by their subsequent recombination into a single embryo as has been demonstrated in some mammals, does this individual, now have one soul and what happens to the additional soul thereby created? So the location of soul is where you want it to be, and there is no consensus on this between different faiths. Furthermore, a common sense view recognises that the majority of eggs, both fertilised and unfertilised in normal circumstances are simply flushed down the toilet without ceremony or undue concern by anyone.

One of the most important medical problems impinging directly on the NHS is the current generation of about fifty per cent of all twin births arising from IVF due to the simultaneous implantation of two embryos. An unacceptably high proportion of the twin births thus created have serious medical problems giving rise to unnecessary pain and suffering for the children and expense for the general taxpayer which is a vitally important matter for the HFEA to consider and respond to.

IS OPEN ACCESS THE FUTURE FOR SCIENTIFIC PUBLISHING?

MEETING OF THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE ON MONDAY 17TH JULY 2006

Competition from the World Wide Web is driven by publishers who levy page charges on the authors, and by self publication, thus removing the need for readers to pay charges for accessing scientific publications. Open Access to scientific literature and databases, guided by those with expert knowledge of relevant topics, is considered essential if the UK is to evolve from primary manufacturing to become a world class, successful and dynamic knowledge-based economy.

The Learned Society business model currently underpins much of the scientific publication and knowledge base, complemented by university-based and commercial scientific publishers. This industry is also vitally important to the economy of some regions of the UK which services an international community of scientists.

Will it be possible therefore to move to Open Access and enable scientific articles to become freely available without irretrievably damaging the present infrastructure, and what will be the consequences of not doing so? Open Access to scientific databases (often publicly funded) is also essential if progress is to be made. How can resistance to this be overcome and the primary data be made available for further scientific study and analysis for the benefit of us all and at minimum cost to the scientist?

During discussion at the meeting the following points were raised:

No change to the peer review model is anticipated with open access publishing, which can and must remain at the same standard as at present and has always been provided to journals free of charge. However the current failure to publish negative results which characterises some industry-funded research, must be addressed by open access publishers. The barrier to authorship from open access, when compared with the barrier to readership, indicates the need for an ongoing subsidy somewhere in the publishing system. There is no reason to believe that a funder-pays model should be any less sustainable than a subscription-based model. Journals are likely to evolve to lower standards due to the need to publish a larger volume of papers to provide sufficient income. Learned Societies, many of whom rely for their existence as publishers, are very concerned about their future. Web-based prepublication review of articles draws in additional reviewers, thereby increasing critical discussion prior to publication. Open access is becoming very complex while at the same time the interlibrary system is collapsing. Many of the journals that are currently most valued are new. It is relatively easy to establish a new high quality journal and Learned Societies will have to adapt, although not all Learned Societies have a journal and it is possible for them either to exist without a journal or to create a new innovative journal based on open access. Web based publishing provides an opportunity for experimentation in new ways of publishing, including peer review. It also facilitates the extraction of data by linking papers together electronically and generating increased access in Eastern Europe and India, for example, which is a desirable and positive result. The pharmaceutical industry is a major funder of research and not a free-rider with respect to open access. Free posting of articles after six months will not deter social scientists prepared to wait. The Bodeleian Library manuscript collection is being made available online. Both humanities and sciences will benefit from this new publishing model.

Is Open Access the Future for Scientific Publishing?

Professor Mark Walport, Director, The Wellcome Trust

The findings of medical research are typically communicated through specialist publications. Journal

The Wellcome Trust has a mission "to foster and promote research with the aim of improving human and animal health". As the UK's largest charitable foundation we spent over £400 million on biomedical research in the UK last year. Key to our mission is ensuring that the results of the work that we fund can be read and utilised by the widest possible audience.

publishers arrange for articles to be checked by experts in the field ("peer review"), and then publish papers in print and on the web. To access the papers, other scientists need to take out a subscription to the journal or pay a fee to access an individual article.

The major drawback of this system is that subscriptions can be very expensive and represent an obstacle to the timely sharing of information through the scientific community and more broadly with the public at large. This situation is difficult to reconcile, particularly given that more than 85% of research undertaken in the UK is funded via the public purse or by the charities.

Our experience of the human genome project has shown that there is a huge benefit in having research findings openly available in the public domain. The genome data is freely available to researchers around the globe and is already being exploited to answer important questions about health and disease.

In a recent exercise that looked at articles in which the Wellcome Trust was attributed as a funder, we found that, at the time of publication, only 6% of these articles were freely available as full text on the Internet. Researchers with access to well-funded libraries fare a little better, but access is still a problem with 10-20% of the articles in this exercise published in journals that these libraries did not have access to due to lack of subscriptions.

Another study of research funded by the NHS showed that although most of the published results are available in full text on the web via subscription services, only 30% of this material could be readily accessed by the general public and more worryingly only 40% could be accessed by NHS staff themselves.

Open access – making research outputs accessible to as many people as possible, for free, via the Internet, offers an important advance in the research process and will help scientists throughout the world make the discoveries we need to improve health and show the public what they are doing.

Open access provides the opportunity for research findings to be more easily read and cited. Providing open access to the research literature also enables these outputs to be linked and integrated with other resources. As data mining tools become more sophisticated over the next few years we will start to see new knowledge being created by the linking of research papers that hitherto had not been seen as relevant to each other. For this to happen, however, papers must be held in an open access repository and not remain hidden behind publishers' authentication systems.

To increase open access to research findings the Wellcome Trust has modified its grant conditions, such that from October 2006 research papers partly or wholly funded by the Wellcome Trust must be made freely accessible via the open access repository PubMed Central (PMC) (or UK PubMed Central once established – see below) as soon as possible, and in any event no later that six months after publication[1].

To help realise the Trust's vision of an open access world, we are working in partnership with a group of major UK biomedical research funding bodies including the Medical Research Council, the Department of Health, Cancer Research UK and the British Heart Foundation to establish a UK version of PubMed Central (UKPMC)[2]. A tender process has been launched to identify a supplier to host, manage and develop this. Based on the US National Library of Medicine's PubMed Central, the aim of this initiative is to create a stable, permanent and free-to-access online digital archive of the full-text, peer-reviewed research publications (and datasets) that arise from the research. UKPMC will be fully searchable and provide context-sensitive links to other online resources, such as gene and chemical compound databases.

Although the open access model provides free access to the literature for the reader there are costs associated with this approach. For example, managing the peer-review process and copy editing the final manuscripts are value-added services that incur expenses. To meet these costs the Trust will provide grant holders with additional funding to cover the costs of page processing charges, levied by publishers who support open access.

In the past few weeks both the MRC[3] and the BBSRC[4] have made policy announcements that mandate their grantees to deposit their peer-reviewed papers in an OA repository. Similar initiatives are taking place at the NIH in the US[5], as well as in Germany[6] and France[7]. And, the recently published EC commissioned report also makes firm recommendations for future action, including improving access to publicly-funded research[8].

In light of these developments it really does seem that open access is the future for scientific publishing.

Making research outputs freely accessible will also help funding bodies to evaluate the research they have funded. Once all Wellcome-funded research is available in PMC (or UKPMC) it will be possible to examine the effectiveness of our funding strategy and re-align it as appropriate. Finally, by mandating our grantees to make all research outputs accessible through PMC/UKPMC, we are helping to ensure that the digital record of biomedical research can be preserved.

1. See: http://www.wellcome.ac.uk/openaccess
2. A full list of the funding organisations working to establish UKPMC can be found at: http://www.wellcome.ac.uk/assets/wtx028464.pdf
3. MRC Open Access policy: http://www.mrc.ac.uk/open_access
4. BBSRC Open Access policy: http://www.bbsrc.ac.uk/news/articles/28_june_research_access.html
5. Details of the NIH Appropriations Bill – which will mandate Open Access for NIH researchers can be found: http://www.earlham.edu/~peters/fos/2006_06_11_fosblogarchive.html
6. Deutsche Forschungsgemeinschaft Open Access policy DFG http://www.dfg.de/lis/openaccess/
7. See: http://openaccess.eprints.org/index.php?/archives/102-Position-of-CNRS-France-on-Open-Access.html
8. See: http://ec.europa.eu/research/science-society/pdf/scientific-publication-study_en.pdf

Is Open Access the Future for Scientific Publishing?

Robert Campbell
President, Blackwell Publishing

I once attended a lecture by a French professor who started by stating that the future predicts the past. The established publishing models largely stem from developments in printing and paper technology two hundred years ago, followed by copyright. An insight into this period of change is given in the French novel, Lost Illusions, by Balzac. The backdrop to Lucien's rise and fall as an author in Paris is the emergence of magazines and newspapers enabled by the dramatic reduction in unit cost.

There was, unlike now, no established business model. Important sources of revenue were bribes from publishers and theatre managers to ensure good reviews of books and plays, or bad reviews of rival works. The business model eventually settled down to a cover price paid by readers and clearly demarked advertising thus enabling reasonably independent editorial policy.

This brings me to the three major concerns over the author-pays or pay-to-publish open access model: the potential reduction in standards; barrier to authorship which could favour the better funded; and sustainability.

Lower Standards

Some critics of the current publishing system don't seem even to acknowledge that there is a cost involved and believe in the internet environment everything can be free. Mark Walport is clear on this. Publishers do a job and there is a cost. The Wellcome Trust is prepared to pay for this.

The problem with charging authors or their employers is the potential distortion of the editorial process. I refer back to Lost Illusions. If the author pays then the publishing system is likely to evolve to suit the author rather than the reader. Standards could fall.

Barrier to Authors

Adopting the author-pays business model may achieve open access for readers but it creates a barrier to authorship. The Wellcome Trust might be able to divert research funds to cover author-pays charges but most institutions are showing no appetite for a new charge and the administrative burden that would go with it. Again we could see a distortion of the system with only the larger institutions in the Northern Hemisphere being able to publish in the most selective prestigious titles; rejecting the majority of the papers submitted is an expensive business.

A complete switch to author pays would result in a net cost for the more productive universities and countries and a reduced cost to the less productive, and no cost to, for example, the pharmaceutical industry (the so-called free rider problem).

Sustainability

Is the author-pays model sustainable? A survey commissioned by ALPSP (the Association of Learned and Professional Society Publishers) indicated that most open access journals are making a loss while most subscription based journals are financially viable.

I quote from the Royal Society's position statement issued last December:

"Funders may be forcing scientific researchers to change the way they publish papers so quickly that disastrous consequences could result." The statement added that peer review journals could be forced to close, "The worst case scenario is the introduction of new journals, archives and institutional repositories that cannot be sustainable in the long run."

When the House of Commons Select Committee on Science & Technology conducted a study of scientific publishing in 2004 it interviewed the Nobel prize winner Harold Varmus as one of the parents of the open access movement and founder of PLoS (the Public Library of Science) which produces author-pays journals. PLoS should be financially viable by now according to his evidence and so it should be with at least $13M of donations. A recent report in Nature, however, suggests PLoS is still some way short of financial viability and last month PLoS raised its basic charge to authors from $1500 to $2500. This may still not be enough and one of the PLoS managers admitted that they may always depend on some philanthropy. We could never get away with such price rises. The PLoS team is top class and producing fine publications but they are also proving what any publisher (as opposed to distinguished scientist) could have told them: with quality comes cost.

The Future for Author-pays Open Access

To sum up this first part: author-pays open access will be part of the future of scientific publishing as long as some well-funded organisations are prepared to pay for it. Publishers such as Blackwell, Springer and OUP offer this option with conventional journals. The limited take up, however, suggests that it will only be a small part and sustained by riding

on the back of the more robust and proven subscription based model.

Are Other Means of Achieving Open Access Sustainable?

There are many other important aspects of open access which will make our debate more complex. There is already a great deal of material made available by subscription based publishers free of charge. So called delayed open access is one element: many STM (science, technology, medicine) articles can be accessed 12 months, some 6 months, after publication. Organisations such as HINARI, AGORA and INASP make available material at little or no charge in developing countries.

And in any case the "journal crisis" that seemed to drive the House of Commons Select Committee's study does not stand up to scrutiny. The Committee had no sense of history and were too ready to be influenced by librarians who have always complained about the cost of publications. Access to titles in British universities has approximately doubled over the last five years at a cost increase of around 50%. Surveys have shown that this improvement in access has been appreciated by researchers if not by the Select Committee.

Yet there is a demand now for public access, that is that the tax payer who has ultimately funded research should have free access to the published results. This is of course a politically attractive idea and publishers are less well organised lobbyists than, say, farmers. I keep 12 bullocks on our meadow and receive two grants for this but I am not expected to hand out free steaks. Villagers are free to roam the meadow which they do without damaging my limited efforts in animal husbandry. This seems a reasonable compromise.

A reasonable compromise seems less likely in scholarly communication. The RCUK (Research Councils UK) has picked up on the public access issue and added "dissemination" to its mission statement. Until recently is has assured publishers, including the many societies that publish, that although it would like to see RCUK-funded researchers post their articles for free access over the net as soon as possible after publication the copyright and licensing arrangements of each journal should be honoured; further policy development would be shaped by independent scientific study of the whole process of scholarly communication. This would include looking at the impact of posting articles on journal publishing. The concern, of course, is that if articles are available over the net soon after publication from an institutional repository then there will be no need for a library to subscribe.

Last month, however, the MRC (Medical Research Council) announced its own policy which included mandated posting of articles within six months of publication. Some of the other councils are taking a more measured approach and they should get the benefit of an extremely well organised programme of research into scholarly communication being conducted by RIN (Research Information Network). In marked contrast to the recently published study of the European scientific publications market commissioned by the EU and the two flawed reports from the Wellcome Trust all the evidence is being assessed rigorously with the help of an advisory group drawn from all spheres of interest; each step is in effect being peer reviewed. I cannot see why the MRC could not wait until RIN's programme is completed.

We do already have the results of a study commissioned by ALPSP which indicates some potential risk of cancellations resulting from widespread posting. An initial analysis of the results from an international survey of the impact of posting on journals carried out by Scholarly Information Strategies on behalf of the Publishing Research Consortium (PRC) also suggests such a risk. Librarians are likely to continue to acquire high quality content but with lower status journals the version posted on an institutional repository might be deemed good enough. Respondents saw little difference between having a publication available upon publication or waiting six months. Librarians are prepared to compromise between the "Final Published Article" and the "Author's copy of the copy-edited accepted article" but there is little interest in the "un-refereed manuscript". Librarians do value the publishing process, even beyond the function of refereeing, but welcomed the challenge that open access poses to publishers.

The PRC will be publishing the full report next month. There is some indication at this stage, however, that posting at six months could damage smaller journals and many of these come from societies. This was the very reason that the NIH (National Institutes for Health) gave for keeping to mandated posting within 12 months. The MRC does not seem to appreciate the vital role societies play in the dissemination and development of information, indeed knowledge.

The attack on the publishing system at this time is ill-judged. It has evolved radically in the last decade and has the capacity to deliver on the enormous challenge ahead. Currently we publish about 1.5M peer-reviewed articles per annum and say 2.5M in total including proceedings of meetings etc. Increased investment in R&D has become fashionable world-wide and there is a direct relationship between the number of researchers and articles produced. In the last two months for example significant increases in R&D funding have been announced from Australia and Singapore. India and China are well known stories. In the EU we have all signed up to taking the R&D spend up to 3% of GDP. If we all achieved this it would result in 700,000 more researchers which equates to say an extra 600,000 articles per annum.

Linked to the public access to articles lobby there is also the demand for open access to the original research data. Publishers are working on ways of linking journals not just to each other (already achieved through its own co-operative venture CrossRef) but to databases. Our efforts to develop new functionality and handle, say, 2.5M peer-reviewed articles per annum in ten years' time should not be undermined by politically motivated publisher bashing.

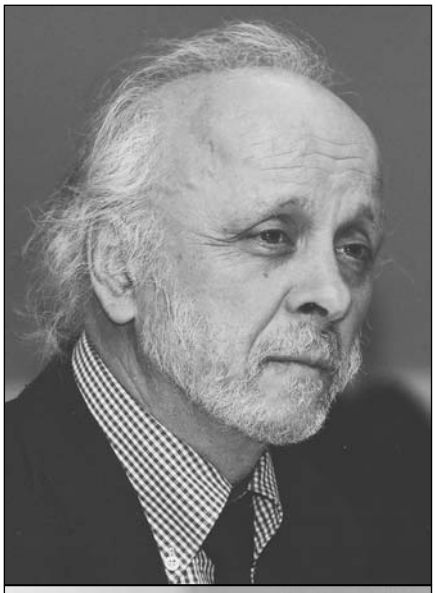
Ill-thought-out public policy could seriously disrupt the development of journal publishing where British companies and indeed societies have dominated the international market. If our aim is to be a successful knowledge based economy the lack of support from some quarters is unhelpful. Achieving universal access, which includes many of the elements of open access, to a much greater amount and range of information is our future. Britain leads in this at present and can go further if we work together.

Open access riding on the subscription-based model by forcing researchers to post articles and thus undermine the system is not sustainable and cannot therefore be the future.

IS OPEN ACCESS THE FUTURE FOR SCIENTIFIC PUBLISHING?

Towards evidence-based open access publishing

Professor David Nicholas and Dr Ian Rowlands
CIBER, University College London



There is a story of a famous architect who, having designed and built a new university campus, walked off the site without finishing the landscaping. The grounds became wild with weeds and long grass. A year passed, and the architect returned, to find a particularly difficult and challenging part of his work had been done for him. Paths were clearly evident as the result of thousands of student and faculty feet making their way from one lecture hall to another, from lecture theatre to bookshop, and so on. The architect had effectively invented "evidence-based landscape gardening", and was able to lay down his flagstones in the full confidence that these were indeed the preferred routes for academic users.

In the fevered atmosphere of the open access revolution, we sometimes seem to be in danger of losing the essence of that simple story as attitudes harden on both sides of an increasingly and surprisingly bitter argument. What we need is an evidence base to help us chart our way through what may well become very choppy waters as pride, cherished business models, and possibly even some publishing companies get thrown out with the bath water.

CIBER, now a part of the new Centre for Publishing at UCL, was established right at the beginning of the open access movement as a non-partisan think tank charged with the mission of creating the kinds of robust evidence that librarians, publishers, research funders and government need to make some sense (and take advantage) of the turbulence around them. Our work has mainly run along two parallel tracks: understanding the views of authors, an obviously critical stakeholder group by means of large-scale opinion profiling, and by analysing the behaviour of an even more critical group, readers, by analysing the transactional web log trails that they leave behind them each time they navigate a digital library, be that a publisher's web site or an open access journal.

The views and attitudes of authors towards open access publishing are largely unformed: despite the intensity with which these issues are debated at library conferences and in select committee, there is widespread ignorance on the part of many researchers. This is slowly changing and will continue to as news of major changes to their publishing practices filters through. Journal authors are a funny breed, though. Our surveys reveal that while they very largely agree with the proposition that high journal prices are a barrier to access, few translate this into action by actively considering the issue of affordability to readers when they decide where to submit their manuscripts. They feel that far too much academic material is being published – by others, of course, since they do not feel they are personally publishing enough. These are classic consumer traits, we all feel a moral obligation to act in an environmentally responsible fashion as householders, yet often we don't get around to recycling our plastic bottles!

The point, of course, is that the publishing system is offering authors and readers a fundamentally different proposition. The key outcomes for journal authors are not necessarily the widest possible readership, but a set of rather narrower and more immediate concerns: making sure they get their ideas date stamped, recognised and lodged for posterity in the highest impact titles. Of course, with their reader hats on, authors are much more focused on the dissemination functions of journals.

Perhaps the key message to emerge from our work with authors is the fact that it is impossible to draw valid generalisations about which policy measures will be most effective in delivering open access. In fact, we would go so far as to say that pushing too hard too soon with

open access policies is likely to be highly disruptive in some, but not all areas. The factors that seem to pre-dispose authors to a positive attitude towards open access (and the reform of the traditional journals system that this represents) are subject discipline, age, availability of funding and geographical region, in that order. There is considerable enthusiasm for open access publishing in physics and the computer sciences, much less so in the social sciences or in the arts and humanities. Age is a critical factor, with younger authors appearing to be much hungrier for change. Geographically, the main drivers for open access seem to be coming from Asia (especially) and from Africa and the former Eastern bloc.

While listening to the views of authors is of course crucial, it is surprising that so little research has been carried out on the readers of open access (or indeed traditional) journals. In fact, there is remarkably little documented evidence of market pull for open access, either from authors or other types of reader, and there is a danger that policy may somehow become detached from reality at some point. One of the key tenets of open access is surely the potential it has for reaching great swathes of readers outside the subscription walls of organisations such as UCL or the House of Commons. This is surely the nub of the success or failure of opening up access to the riches of the scientific literature for people in small businesses, GPs, university alumni, the uninformed patient.

This lack of research is all the more surprising given that the data on online readership already exist in the form of the transactional web logs that provide the digital fingerprints of millions of users. CIBER has developed unique insights into these fingerprints using a technique called deep log analysis. Unlike surveys, there is no hiding place for self-delusion in deep logs, they simply report what happens when millions of users are let loose in cyberspace.

Perhaps the most exciting line of current CIBER research is the real time experimentation we are conducting on behalf of Oxford University Press. Trying to get answers to such deceptively simple questions as Does open access in fact deliver more readers? Are open access articles more likely to be cited than those hidden behind subscription barriers? is very difficult. There are so many uncontrolled variables that we end up comparing apples and oranges. What we really need is a detailed case study of a journal that has made the transition to fully open access and this is precisely what we have in the case of Nucleic Acids Research, a flagship journal of Oxford University Press. By any standards, NAR is a success story for British publishing. Even before going fully open access, it was attracting vast numbers of hits (from 1.5 million different IP addresses over the period January 2003 to June 2005). The decision to move to a full and immediate open access, funded by research sponsors, has resulted in further increases in usage, fuelled mainly by opening up the content to Google so that existing subscribers had another route in. Open access ***per se*** probably accounts for only an additional 7-8% of traffic, much of that coming from the former Eastern bloc. These are very early days, and who knows what open access will really deliver over the longer haul. In the mean time, publishers brave enough and honest enough to try these experiments will be able to see for themselves what actually happens and be able to take a commercial view as to whether author-side payments are the best or only mechanism (among many) of meeting consumer demands for immediate information gratification.

In conclusion, continuing independent research is vital in this area. Claims and counterclaims from both sides of the debate need to be evaluated and put into their wider context. Much of what passes for evidence is in fact highly selective, anecdotal and simply hardens the concrete bunkers in which ideologues on both sides reside. Not to use the huge evidence base we have accrued to help pilot our policies and decision making makes no sense at all.

Publishers have made enormous contributions to making the scientific literature accessible and easier to use through their investments in digital libraries, linking services and rolling out new business models such as the Big Deal, un-embargoing content which becomes open access after as little as six months and opening their sites to search engines and so encouraging in the "disenfranchised" user. Their services are hugely popular and have to be recognised for the success that they are, and there is a danger this is being lost in the heat of the argument. The problem is their very success, and the consumer expectations of the internet fuelled by Google, Amazon and the rest mean that they cannot rest easy.

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Science and Globalisation

The Attlee Suite was standing room only for the annual Parliamentary Links Day on 27 June organised by the Royal Society of Chemistry on behalf of the whole scientific and engineering community and co-sponsored on a bipartisan basis by Dr Brian Iddon MP and Mark Lancaster TD MP with the support of the Commons Science and Technology Select Committee.

The highlight of the day was the first public speech given by the new Foreign Secretary, **Rt Hon Margaret Beckett MP**, who addressed the audience of Members of Parliament, scientists and engineers, on the subject of the **Globalisation of Science**. She said Links Day is the most important science-related event in Parliament, and the UK's position and influence abroad is linked with our science skills. Six of the top ten European universities are in the UK and they produce 12% of all scientific paper citations. China and India are becoming the new science super powers as China produces more science graduates than the whole of Europe. The Foreign and Commonwealth Office Network helps to attract R&D investment and to bring in know-how. This increases the profile of UK science. The Partners in Science scheme organised 130 events in China in 2005 with significant bi-lateral links in subjects ranging from climate modelling to astronomy. The FCO appointed John Ashley to work in partnership with countries where energy demand from coal fired power stations is increasing, with a budget of £3.5 million for this work. The FCO is working with the Hadley Centre on climate modelling and renewable energy sources. Young people are enthusiastic about the environment and this is an opportunity to demonstrate the contribution that science and engineering can make to caring for the environment.

The President of the RSC, **Dr Simon Campbell**, indicated that the RSC is the most effective international organisation for the Chemical Sciences, with 43,000 members (8,000 overseas). The global chemical industry is driven by market opportunities and legislation concerning R&D and innovation. Quality, efficiency and R&D are more important than low wages when selecting locations for manufacturing. For example, Pfizer started in Germany, moved to the US and is now established in Kent. R&D follows the market, but under present UK legislation, industry is reluctant to pay for innovation. The REACH proposals will create barriers to trade and leadership in the chemical industry will move out of Europe. Singapore, where R&D is 3% of GDP, has now become a major manufacturing centre despite being a high wage economy.

Dr Robert Kirby-Harris, Chief Executive of the Institute of Physics, which has 35,000 members (9,000 overseas), indicated that the UK is a world class player and the industry employs 1.8 million people in the UK. Physics underpins almost all technology; it is interdisciplinary, innovative and international, but the exploitation of inventions in physics is a non-linear process. The IoP supports sustainable development and science education with a mobile Lab-in-a-Lorry that brings science to young people, and training in entrepreneurship and economic development, and a centre for maths in South Africa. The UK supports many European facilities including CERN and the Large Hadron Collider which is due to start work in 2007, and may help discover the elusive Higgs boson.

The Chief Executive of the Institute of Biology, **Professor Alan Malcolm**, presented a case history about GM crops. There were no GM crops ten years ago. There are now 1 million sq km of GM crops, about 4 times the area of the UK. There are none in Europe, apart from about 60,000 sq km of animal maize in Spain. Throughout the world GM comprises 50% of all soya, which is herbicide tolerant, 25% of maize and 10% of cotton, both insect resistant. GM crops reduce labour costs, water consumption, exposure to toxic chemicals and increase yields. GM cotton is popular in China and India. In the UK 75% of processed food contains soya bean. The Chinese economy is expanding

enormously and the people have more money to spend. Meat consumption has doubled in China recently, along with the need to import Brazilian soya beans. GM technology will preserve the environment by helping to reduce the need to cut down more of the Amazon forest to grow soya.

The Foreign Secretary of the Royal Society, **Professor Dame Julia Higgins,** described how the Royal Society co-operates with the Government and NGOs, and works closely with the OST, FCO and engages with other academics on matters of policy, with expenditure of £7 million on international work. This includes stimulation of international scientific collaboration, promoting international lectures, providing science commentators and supporting public engagements. The Royal Society has initiated a pairing scheme with MEPs in the European Parliament and intends to expand the scheme to MEPs of other nations. Helping the developing world is another major overseas activity of the Royal Society, by strengthening the role of African academics in Ghana and by helping them to provide advice to their governments. The RS has funded, and is looking forward to developing a partnership with a party of African scientists who are visiting in October 2006. A prize to encourage young African scientists has been given by Pfizer.

The Vice President and International Secretary of the Royal Academy of Engineering, **Professor Peter Saraga**, stated that members of the RAEng are equally divided between academics and the engineering industry and contribute to every part of the UK economy by raising our performance. The markets are global and the economy and engineering future depend on maintaining a competitive edge and the capacity to manage international R&D. The R&D base must be encouraged and strengthened as global companies such as IBM can undertake their research in any country. The national R&D base also needs to understand the requirements of the users including the need for multi-disciplinary contributions working in effective and open partnerships.

The First Secretary for Science and Technology, Embassy of the People's Republic of China, **Mr Zhiyong Jin**, presented a summary of China's industrial activity and output. The GDP last year was $2,279 bn, up by 9.9% from the previous year. Oil production and energy consumption and generation have all increased, the latter boosted by the Three Gorges hydro-electric project. The Tibet railway, which is 1,142 km long and rises to an elevation of 4,000m, has been completed. China's investment in R&D for science and technology was $29.59bn in 2005, which is 1.3% of GDP and the number of graduates will increase from more than 3 million in 2005 to more than 4 million in 2006. China is establishing diplomatic ties and connections with many overseas countries to carry out co-operative projects.

The Science & Technology Counsellor, United States Embassy, **Mr Jason Hahn**, reminded the audience that Benjamin Franklin was an early member of the Royal Society. He discussed the possibility of a virtual science library which would include developments to encourage economic growth such as international meteorological measurements and global earth observations.

The Chairman of the House of Commons Select Committee on Science and Technology, **Mr Phil Willis MP**, emphasised that the future of mankind depends on science to solve problems such as energy, global warming and disease and research should be shared with the global community. The Government's priority is to reduce carbon emissions as a response to climate change. It is working with China to build a carbon capture power station in China. The ITER fusion power project is an example of international co-operation.

The Chief Scientific Adviser, **Sir David King**, said that science, technology and innovation impacts on government. He emphasised the role of advances in the medical science on the world population, which doubled from 1bn in 1800 to 2bn by 1930, doubling again to 4bn in 1975. The population is over 6bn and is expected to reach 9bn by 2050. The Chinese economy is increasing. It will equal the combined economies of the EU and the USA by 2045. The UK's R&D target is 2.5% of GDP by 2014 with a further 1.9% of private R&D. The service sector is growing faster than the manufacturing sector, which accounts for half of our exports. High value-added products and services are needed. The Global Science and Innovation Forum (GSIF) has an overarching approach to flooding and coastal defence. Many overseas scientists are involved in the detection and identification of infectious diseases and tackling obesity. Science writers are required to communicate this information to the public.

Report by Robert Freer (Royal Institution of Great Britain)

BOOK REVIEW

The Ageing Countryside

Lydia Speakman and Professor Philip Lowe
Published by Age Concern ISBN: 0862424143

The late and great JK Galbraith first warned us about accepting "the conventional wisdom" in his book "The Affluent Society". I have been on my guard ever since and never more than with two of the current conventional assumptions. The first is that an ageing society is a bad thing, and the second is that rural England is in deep crisis. Some environmental academics have brought the two together with a collection of essays entitled "The Ageing Countryside" edited by Professor Philip Lowe and Lydia Speakman. They have produced an impressive analysis of the changing demographics of rural Britain.

Britain, like all large Western European countries, is getting older as people are living longer and produce fewer babies. There are two main contributory factors – the remarkable progress of medical technology and younger women's preference for work over breeding. In rural England these trends are even more pronounced by the substantial migration of older urban dwellers to the countryside and a growing exodus of younger people from the countryside to the towns.

The conventional wisdom is that an ageing society becomes less productive and therefore less prosperous. The cost of maintaining these prolific pensioners is, the argument goes, a huge burden on those in work. Furthermore, we are led to believe, rural society is already in a crisis, and all these extra old people will lead to catastrophe.

One difficulty, when analysing rural issues is in defining what we mean by rural. In England any conurbation of 10,000 or less is seen to be rural. The author uses this definition and concludes that there is a rural population of 18m, or 36% of the population, which surely overstates the figure. In Scotland the figure is a more realistic 4,000. In France there are two categories – "urban/rural" which embraces anyone living within about 100 kilometres of a major urban conurbation, and "rural/rural" for those living outside this radius. The French would argue that the serious rural problems lie in the remote areas, rather than in the Sussex and Hertfordshire countryside.

The rural lobby brilliantly exploited the short-term crisis created by the Foot and Mouth outbreak in 2001, to suggest that the countryside was in a meltdown and in urgent need of regeneration. But the evidence in this book suggests otherwise. Using the English definition the rural population is growing for the first time since the repeal of the Corn Laws in 1845, as inward migration exceeds outward. Rural England is healthier and more educated than it ever was, and in addition more prosperous than the towns. There is rural poverty but it is much less severe than urban deprivation. The problems are ones of success not failure – too many house purchasers forcing prices beyond the reach of potential first time buyers, too few workers to carry out the hard physical work in farming. Indeed, were it not for the extraordinary inflow of workers from Eastern Europe most of the daffodils in Cornwall, fruit in Evesham and Kent, and vegetables in Lincolnshire would not be harvested. The IT revolution has enabled rural business to engage in markets which in the past would have been inaccessible.

The ageing population, in town and country, is by no means an economic burden. Most old people replace a big house with a smaller one when moving from high cost London to low cost Devon and Cornwall, and with additional benefits of pensions and savings, are relatively affluent. As consumers they stimulate local economies. More and more grandparents become productive child carers, to enable their children to return to work. Huge numbers of old people, like myself in my seventieth year, are still at work, albeit part time. In rural England, the old people have a much stronger commitment to communities, an essential element in a vibrant countryside. Old people have exploited the IT revolution with alacrity.

Of course as the book points out, there are too many vulnerable young and old people in the countryside. Whilst 86% of people have access to a car, those who do not, mainly young and old, can feel remote at a time when the majority enjoy unprecedented access to the "delights" of modern urban life, supermarkets, leisure and high quality hospital care. More houses need to be built in rural towns and villages which are affordable to young people. But the rural population resists such proposals because they may undermine the quality of rural life.

A curious feature of English rural society is that, although it is politically conservative, it paradoxically adopts a culture of dependence on the state, (just as, despite its anti-European stance it fiercely protects the benefits it receives from the CAP). But demands for more government rural initiative should generally be resisted, except where, as in the case of affordable housing, planning reforms could tackle a problem common to both town and country.

Rural England stands to benefit from the increase in prosperous elderly immigrants, as long as the rising inward flow of younger people from Eastern Europe ensures that the rural economy continues to thrive.

Lord Haskins

To order a copy of The Ageing Countryside for £14.99 plus postage, please call 0870 44 22 120, or online at www.ageconcern.org.uk/bookshop

UK-Singapore: Partners In Science – Partners Of Choice

Brian Ferrar, First Secretary, Science and Technology, British High Commission, Singapore

Sitting in the British High Commission's S&T Office at the Biopolis, Singapore's state of the art biomedical sciences facility, it is difficult to imagine this was a greenfield site just three years ago. The Trade & Industry Select Committee visited shortly after the Biopolis opened. Seven buildings now house some 2000 researchers in government research institutes (RIs) and private companies such as GSK and Novartis. Many are already conducting world class research.

Singapore has been highly successful in attracting top researchers from all over the world including Sir David Lane from Dundee University and Yoshiaki Ito from Kyoto University. It is also funding a massive scholarship programme to nurture its own talent. The Agency for Science Technology and Research – A*STAR – which is spearheading Singapore's drive in the biomedical sciences, is funding 1000 students to the tune of £300k each so that they can study from BSc to PhD at top overseas universities, including selected British universities.

This new drive in the biomedical sciences complements Singapore's traditional research strengths in areas such as materials, microelectronics and manufacturing technologies. Learning from the success of the Biopolis, Singapore is creating a new centre – Fusionopolis – to bring together the RIs in the physical sciences so that they can be co-located with companies in one massive facility. The intention is to enable companies to benefit from the RIs' expertise and facilities. Training manpower is key and a constant flow of RI staff into companies is strongly encouraged.

Singapore is a small but important player on the world's research stage. It plans to increase research funding to 3% of GDP by 2010 and has recently established a new National Research Foundation with £1.8 billion of funding for longer-term strategic research.

To succeed, Singapore knows it has to form partnerships with other countries. Whilst Singapore and the UK have had close historical links, Singapore has tended in recent years to look towards the US for its research collaborations. The S&T team at the British High Commission in Singapore was expanded in 2004 to ensure that opportunities for the UK were grasped, particularly as Singapore expands its research efforts into new areas of great importance to the UK, such as stem cell research and nanotechnology.

In November 2004, we launched a year-long UK-Singapore partners in science campaign to highlight the excellence of UK science and promote collaboration with Singapore. Launched by HRH The Duke of York at the Biopolis this campaign quickly proved to be a great success, comprising talks by leading UK scientists, exhibitions, competitions, workshops and joint activities with companies such as Rolls Royce, GSK and BAE Systems.

Such was its success that in July 2005 Prime Ministers Tony Blair and Lee Hsien Loong decided to convert the campaign into a long-term strategic initiative. They signed a statement on science, engineering and technology in which they agreed to encourage scientific collaborations and networks and help build scientific capacity with South East Asian Partners.

With funding from the FCO's Global Opportunities Fund, together with contributions from partners in Singapore and the UK, we have held workshops in areas such as materials, immunology, neuroscience, bioelectronics and chemistry. These have led to close links and new collaborations between British and Singaporean researchers. Key researchers from other countries in South East Asia are invited to take part so that they can form links with UK and Singaporean researchers. Each workshop has been followed up with Collaboration Development Awards to enable researchers from the region to visit the UK to develop collaborations. Around 75 awards have so far been made leading to numerous collaborations.

In the latest stage of the UK-Singapore partnership, we jointly sponsored, with A*STAR, a conference in July 2006 on Scientific Capacity Building with South East Asian Partners. Representatives from ten countries in the region attended. The conference identified good practices and drew conclusions as to how capacity building can best be undertaken in the future. It provided policy-oriented inputs for decision-makers in South East Asia, the UK and multilateral fora, including the role science can play in meeting the Millennium Development Goals.

But our work is not confined to promoting collaboration. We use science as a key diplomatic tool in promoting the UK-Singapore relationship and promoting British strategic interests. A good example was how we created a Sports Science and Engineering exhibition, visited by the Prime Minister and David Beckham, as a key element in our support for London's successful bid to host the 2012 Olympic Games.

We will continue to use science diplomacy as a key tool in promoting the UK's international strategic priorities.

School Meals

Alan D B Malcolm, Chief Executive, Institute of Biology

People in the UK have recently been aroused by a young TV star chef, Jamie Oliver, to discover that our children are not only being offered high fat, high salt food at school, but are also ingesting the bits of animals that their parents would probably reject (albeit processed into shapes that disguise what they once were). This is scarcely surprising on a budget of around forty pence especially when considered with the general lack of facilities and skills.

What anybody expected for a budget of 40 pence, heaven knows.

In many schools there is no kitchen. Some have no space where children can sit and eat in a civilised manner. Lunch breaks of as little as 40 minutes scarcely provide time for a balanced meal.

Needless to say, they do things much better across the channel in France. The meal will cost several times as much (more than £2 per pupil), contain three separate courses including fruit and salad, and will have a space in the day of at least 90 minutes to allow proper digestion.

How did we get into this position?

Britain has a problem taking food, diet and nutrition seriously. We teach children in schools to appreciate the aesthetics of art and music, but eating is simply an indulgent pleasure. Any deficiency of sight or hearing constitutes a medical condition requiring specialist treatment, and probably exemption from military service. A deficiency in the senses of taste or smell would not give rise to a similar level of concern. Until recently our scientific understanding of the physics and biology of sight and hearing ran well ahead of our knowledge of the genes for olfactory receptors (now known to be densely located on chromosome 11).

School meals were introduced neither for educational purposes nor for humanitarian reasons. Their prime motive was to enable Britain to wage war successfully.

Recruitment at the time of the Boer War (1899) showed just how badly nourished were the nation's youth – some 85% of potential conscripts were not fit enough to be recruited.

Uptake of school meals was hugely increased during World War II to enable the mothers to work in the fields and factories in place of the men who had gone to fight.

With these origins, it is not surprising that the reasons for their existence today are rarely clearly enunciated, and not universally accepted. One result is that responsibility for their provision, and hence the budget, has moved back and forth.

In 1906 Local Education Authorities (LEAs) were allowed but not compelled to provide free meals provided that the funds were raised locally. By 1914 central Government reimbursed 50% of the cost, and this subsidy was increased to 95% in 1941. By the end of the Second World War LEAs were allowed to continue meal provision even at weekends and during school holidays.However, in 1967 all the financial responsibility was returned to the LEAs.

In 1988 schools achieved the right to become "grant maintained" which involved receiving a block grant from the LEA to provide all services including school meals. Thus the headteacher (responsible to the school governors) now held the budget.

While the origins lay in physical fitness, it was not long before it was acknowledged that a hungry or malnourished child was less likely to benefit from educational opportunities.

In 1941 it was established that such a meal should contain 1000 kcal (approximately one third of the daily needs of an active teenager), 20-25 grams of animal protein, and 30 grams of fat. Moreover it was explicitly stated that "Good food must not be spoiled by bad cooking."

While the exact prescription changed over the next six decades, there was always an attempt to relate the contents to one third of the daily requirements of the growing child. As nutritional knowledge developed, insistence on occasional fish and fruit appeared.

Along with the school meal, there also appeared the provision of one third of a pint of milk, either free or at cost. During rationing from the 1940s to the early 1950s this was a major priority for milk producers and processors. It was the withdrawal, in 1968, of this entitlement to milk which first drew the attention of the electorate at large to Margaret Thatcher.

The costs of supplying the free or subsidised (the labour costs of production and delivery were never charged for) food moved from central government to local authorities to schools (and hence head teachers and governors). While the former might be happy moving the bill from education to social subsidy and back again, the latter were more likely to regard their responsibilties as being limited to the provision of lessons.

In 1980 came the final straw with the cancellation of nutritional standards together with the insistence that the supply of the meals should be allocated to the commercial enterprise who submitted the lowest tender.

The ultimate consumer, the pupil, would in practice determine where the profit lay by exercising their freedom of choice about whether to eat chips, burgers and pizza or a fresh green salad with tuna or cheese. This freedom of choice was often presented as if it were a fundamental human right, ignoring the fact that children under 16 often have rights denied to them (consumption of alcohol and tobacco, for example) when to exercise such a choice might do them physical harm. Choosing an inappropriate diet was not added to such a list. Vending machines in schools would rarely allow the choice of an apple or a banana to be made.

By 1991 the increasing costs of unhealthy lifestyle in adulthood – obesity (and hence diabetes), cardiovascular disease (from elevated fat and salt intake) encouraged the government to produce "Health of the Nation". This enunciated ten targets to be reached by 2005 including items such as lowering obesity, blood pressure, fat intake

etc. None of these has actually been achieved mainly because few steps were taken which might bring them about. In particular little was done about improving the diet of children at school.

Schools study "citizenship" but could this not include the concept of sitting down with colleagues for 40 minutes in the middle of the day and peacefully enjoying a pleasant meal?

It would have to be demonstrated to reduce truancy or exclusion levels before such an activity would assist a school in the national league tables, or in dealing with the enquiries of the government's school inspectors.

The national curriculum certainly includes diet and health, but much of this is presented in a theoretical way with little in the way of practical skills such as food preparation. Most schools would lack the physical facilities to allow this to happen.

When faced with the competing demands of well equipped science laboratories or kitchen facilities for pupils to experiment with cooking, school governors know which parents would demand.

The report of the School Meals Commission produced rapidly in late 2005 is still being chewed over.

The team not only contained academic nutritionists and school teachers, but also representatives from the catering trade.

The report contains an impressive list of 35 recommendations. Some are so obvious that it is impossible to imagine any resistance: "the nutrient standards proposed in the this Report should be applied to the provision of school lunches", "these standards should be applied to tuck shops and vending machines", "there should be easy access to free, fresh, chilled drinking water throughout the day", "all children should be taught practical cooking skills". Others such as: "schools should prioritise the refurbishment of kitchens", "schools and caterers should look to local farmers for their produce where possible" may be more challenging to achieve. The report also emphasises need to bring in change gradually, but to monitor progress at regular intervals.

It must be devoutly hoped that it will prove a catalyst for change even if we no longer wish to make our children fit only to become cannon fodder.

A list of further reading material on the subject is available from the author a.malcolm@iob.org

The Energy Challenge

The DTI's Energy Review Report 2006

Robert Freer, The Royal Institution of Great Britain

This is the third Government publication on the national Energy Policy in just over four years and for the first time there is some sign of positive action by the Government to recognise and solve the main problem, which is to ensure the security and reliability of the national electricity supply for industry, commerce and domestic use. In other words, to keep the lights on.

The first of the three policy statements was published in February 2002 by the Policy and Innovation Unit in the Cabinet Office. This was a comparatively workmanlike document which contained some illuminating statements such as "the history of energy reviews is littered with failed attempts to forecast the use of fuels", and the authors admitted that this review "is unlikely to be an exception".

The PIU report was followed in 2003 by the Energy White Paper which set out four objectives which the Government sought to achieve. These objectives were to cut CO_2 emissions by 60% by 2050, to maintain reliability of energy supplies, to promote competitive markets in the UK and beyond, and to ensure adequate and affordable home heating. But however commendable these goals might be individually, in practice they were likely to be mutually incompatible. For instance cheap electricity was not necessarily a sensible long term policy. By driving down the price of electricity for the consumer there was less income for the generators to invest in new plant which would ensure continued security of supply from our ageing power stations, and there was no other incentive for them to do so. Today that lack of investment in new plant has become a major problem.

This latest energy review is entitled The Energy Challenge[1] and again appears to be more of a wish list than to define a positive plan of campaign.

The Foreword written by the Prime Minister does however contain some realistic observations which mark positive steps in the right direction. It does recognises the importance of a secure supply of energy and says that "without it we could not function as an economy or modern society". It puts energy security as the first of the "immense challenges" we face as a country and it also recognises that the complete solution will depend partly on building "new nuclear power stations to replace those becoming obsolete". Serious energy engineers and analysts have been saying this for years. Had their advice been taken at the time we would now have the people and the infrastructure in place to do this work. But today the reality is that we will have to buy much of the nuclear expertise and equipment from abroad, in an industry which we pioneered and were once among the world leaders.

In the preface by the Rt Hon Alistair Darling MP he highlights the need to get the right incentives to encourage investment in low carbon options, and he also recognises the particular problem of getting planning consent, a problem which in the past has dogged and delayed the building of new transmission lines and new power stations such as Sizewell B. He concludes "it is time to overhaul the present planning system".

The Energy Challenge starts by committing the Government to the European Emissions Trading Scheme (ETS) which it believes to be the incentive for energy efficiency and for investment in low carbon technologies. The Government wishes to "ensure (it) develops into a credible long-term international framework".

A more realistic ambition is the challenge to use less energy. This is where we can all contribute. One encouraging statement is the objective to reduce the energy used in Government buildings, "we aim to make the central Government estate of buildings carbon neutral by 2012". For buildings alongside a river this could probably be done by using a heat pump, but if the Government is relying on solar panels and a windmill on the roof they may find this objective difficult to achieve.

The signals for new nuclear build are at amber if not yet at green. The Government promises "a clear statement of our position on new nuclear build" and to address potential barriers to new nuclear build.

The Government also believes coal has a role to play in the energy mix, having realised that last winter more than half our electricity was generated from coal. But our coal fired stations also suffer from a lack of long term investment.

The failure of the Government's present energy policy has been criticised in the House of Lords "the electricity supply industry, since privatisation, has been without leadership reacting only to external stimuli which masquerade as the discipline of a free market". Those looking for leadership from the Energy Challenge may still be disappointed. The Government should be taking giant strides towards their objective; the Energy Challenge is just a small shuffle.

[1] The Energy Challenge. Energy Review Report 2006 (DTI Cm 6887 July 2006)

LETTERS TO THE EDITOR

Sir,

It was with great interest that I read the articles by John Ferguson from the ABPI and Richard Freudenberg from the BAEPD in the two previous issues of Science in Parliament.

Mr Ferguson said he believes parallel trade of medicines in Europe poses a risk to the safety of the pharmaceutical supply-chain while benefiting no-one.

Two events this summer again underline why emotional statements such as these need to be scrutinised closely – and ultimately rejected.

First, two incidences of counterfeit Lipitor were detected in the UK in July and August. Pfizer, the maker of Lipitor, immediately pointed fingers at parallel trade, saying the practice was to blame. Only a few days later, Nimo Ahmed, head of intelligence at the MHRA, ascertained that the counterfeit was completely unrelated to parallel trade but was in fact detected in the normal Pfizer supply chain.

This is just the latest example in what appears to be a pattern of repeated, unfounded accusations against parallel trade – nothing short of a smear campaign which scares patients for no reason.

As Mr Freudenberg pointed out, there has never been a case of counterfeit medicines in the UK supply chain resulting from parallel trade. Parallel distribution has an impressive safety record, not only in the UK but throughout Europe.

But we are far from being complacent about the risk of counterfeit medicines. The members of the European Association of Euro-Pharmaceutical Companies (EAEPC) – individually and collectively – have taken a series of initiatives to make sure parallel trade remains as safe as it has been until now

The second event this summer concerns the question of the economic impact of parallel trade.

In June, the University of Southern Denmark published a new study on parallel trade. It reconfirms that parallel trade generates substantial savings for European patients and health insurers, particularly in the UK.

For the study's author, Kjeld Møller Pedersen, the existence of savings from parallel trade is a fact. The interesting question is how high these savings are.

According to the new study, by choosing a parallel imported medicine over the (identical) domestically marketed product, consumers in the United Kingdom, Germany, Sweden and Denmark paid €441.5 million less for their medicines in 2004. In the UK alone, savings amounted to €237 million, which represents 10% of parallel import sales.

The existence of savings is not only proven empirically but also makes intuitive sense. If they weren't cheaper, why would the practice exist?

In addition to the direct savings, parallel distribution also exerts dynamic competitive pressure on the price of medicines. With pharmaceutical expenditure still increasing and with pressure on government budgets throughout Europe parallel distribution provides concrete savings.

Under the UK's PPRS, manufacturers have the opportunity to modulate prices every 5 years. Not surprisingly it is often the products exposed to competition from parallel imports that undergo the most significant price reductions. While such a response by manufacturers to competitive pressures from parallel trade ultimately erodes the price margins and thus the incentives for parallel import, the UK Government and patients have the lasting benefit of lower prices for branded medicines.

Mr Ferguson's statement that parallel distributors "take value out of the system whilst giving nothing back" is simply not true.

Pharmaceutical manufacturers are likely to continue pointing fingers at parallel distributors to try to hurt their only competition.

But our industry will continue to defend itself. The facts are on our side.

Dr Heinz Kobelt,

Secretary-General of the European Association of Euro-Pharmaceutical Companies (EAEPC) www.eaepc.org

Sir,

Those of us who are London householders and pay the Mayor's ever increasing part of the Council Tax will be concerned at some of the proposals put forward by Allan Jones in the Summer 2006 issue of Science in Parliament.

While we all support the Mayor in his efforts to improve London's energy supply the proposal to build an offshore wind plant of a nominal 1000MW in the Thames Estuary (referred to in Fig 7) is one of the most expensive and least cost effective methods.

According to figures published by OFGEM the average load factor for all the existing windmills throughout the country is 23%. London and the Thames Estuary are just about the

least windy parts of the country and therefore the load factor of a wind plant in this area will be less than average. This means that for 80% of the time it will need 1000MW backup by conventional fossil fuel generating plant to produce its rated output. This defeats the object of trying to rely on intermittent renewable energy.

The output from windmills is very variable and is sensitive to the wind speed. Large wind turbines produce their rated output typically between wind speeds of force 7 to force 9, ie near gale to strong gale, and very little at lower or higher speeds. Gales don't occur very often in the Thames Estuary.

Windmills produce very little energy, no reliable power and are a potential electrical disturbance when connected to the National Grid, as has been experienced in Denmark, Germany and Japan. Windmills are not economic and no-one would build them without the Government's generous subsidy, which has been estimated to be some £30 billion by 2020. Offshore windmills are particularly expensive both to build and maintain.

The proposal to use wind energy to make hydrogen for vehicles and ships (Fig 8) needs more careful consideration. Making hydrogen by the electrolysis of water is energy intensive and the Energy Review published by the Policy and Innovation Unit of the Cabinet Office in 2002 estimated that the energy required to make enough hydrogen just for our road transport would be nearly 400Twh per year. Since the total output of all the windmills in the country is only about 2Twh per year wind energy is unlikely to make much impact.

If the Mayor is looking for new sources of local heat and power the best bet is the thermal recycling of London's municipal waste. The old Battersea power station would be a good site for London's Energy from Waste plant with district heating to the flats in Pimlico.

Robert Freer
Royal Institution of Great Britain

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.

Water Management

The Committee's report was published in June, and the Government response was received in August, followed in early September by a separate response from the industry regulator, Ofwat. The report is to be debated in the House on Friday 14 October.

Science and Heritage

Sub-Committee II has completed its inquiry into Science and Heritage. The Committee is currently considering its draft report and recommendations, which will be published in November. Following the report's publication the Committee is planning to hold a seminar to offer those who gave evidence an opportunity to discuss the Committee's recommendations and provide feedback.

Science Teaching in Schools

The Select Committee has completed its short inquiry on Science Teaching in Schools. During the course of this two-month inquiry the Committee heard evidence from, among others, Government representatives, OFSTED, the Association for Science Education, the learned Societies with an interest in this area and teachers' unions representatives. The Committee travelled to York to visit the National Science Learning Centre and Huntington School, a comprehensive school which has been granted technology college status. The Committee also visited Little Heath School in Reading, a specialist school in science and mathematics.

New inquiry: Personal Internet Security

The Select Committee has appointed a Sub-Committee to undertake an inquiry into personal internet security. A call for evidence for this major new inquiry, which will be chaired by Lord Broers, was published at the end of July with the inquiry proper due to commence in the autumn. The Sub-Committee's report is expected to be published next summer. The inquiry will be launched in November. The Committee has invited evidence on security issues affecting private individuals when using communicating computer-based devices, either connecting directly to the Internet, or employing other forms of inter-connectivity.

New inquiry: Allergy

The Select Committee has also appointed a Sub-Committee, to be chaired by Baroness Finlay of Llandaff, to investigate allergy and allergic diseases. The inquiry will address all types of allergy and cover a full range of policy issues but will not focus primarily on allergy service provision, which was the subject of recent reports by the House of Commons Health Committee and the Department of Health. A call for evidence was published at the end of July and the inquiry will be formally launched with a seminar in October.

Further information

The written and oral evidence to the Committee's past inquiries mentioned above, as well as the Calls for Evidence on the Committee's new inquiries, can be found on the Committee's website www.parliament.uk/hlscience. Further information about the work of the Committee can be obtained from Cathleen Schulte, Committee Specialist (schultec@parliament.uk or 020 7219 2491). The Committee's email address is hlscience@parliament.uk.

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 (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

Science Question Time

The Committee hosted a "Science Question Time" with Lord Sainsbury of Turville on Tuesday 20 June.

Human Reproductive Technologies and the Law: Follow-up session

On Wednesday 12 July, the Committee took evidence from Caroline Flint MP, Minister of State for Public Health, Mr Hugh Whittall, Divisional Head, Scientific Development and Bioethics Division, and Mr Ted Webb, Section Head, Assisted Reproduction Services, Policy and Regulation, Department of Health. This session was a follow-up to the Committee's Fifth Report of Session 2004-05, *Human Reproductive Technologies and the Law* (HC 7) and the Government response (HC 491).

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. On 5 July, the Committee took evidence from Rt Hon Alistair Darling MP, Secretary of State for Trade and Industry, Professor Sir David King, Government Chief Scientific Adviser and Head of the Office of Science and Innovation, and Sir Brian Bender KCB, Permanent Secretary, Department of Trade and Industry.

During the course of this inquiry the Committee also considered 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. Reports on the case studies were published in June, July and August as detailed below. The Committee expects to publish a Report on the overarching inquiry in the autumn.

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.

On Wednesday 21 June the Committee held a public seminar on human enhancement technologies in sport at which it heard from Mr Linford Christie OBE, Professor Ron Maughan, University of Loughborough, Mr Steve Maynard, HFL Ltd, and Professor Julian Savulescu, University of Oxford. The first oral evidence session took place on 24 July when the Committee took evidence from Mr Matthew Reader, Head of Elite Sports Team, Department for Culture, Media and Sport, Mr John Scott, Director of Drug Free Sport, and Ms Allison Holloway, Education Manager for Drug Free Sport, UK Sport.

Research Council Institutes

The Committee announced its terms of reference on 22 March. 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 first oral evidence session took place on 28 June when the Committee heard from Professor Julia Goodfellow CBE, Chief Executive, Biotechnology and Biological Sciences Research Council, Professor Colin Blakemore, Chief Executive, Medical Research Council, and Professor Alan Thorpe, Chief Executive, Natural Environment Research Council.

UK Space Policy

On 19 July the Committee announced a major new inquiry into UK space policy. The inquiry will address some key broad issues including: the impact of current levels of investment in space-related activities on the UK's international competitiveness in this sector; the benefits and value for money obtained from participation in the European Space Agency and other international programmes; the maximisation of

commercial benefits and wealth creation from UK space-based technologies through innovation and knowledge transfer; the delivery of public benefits from the space-related activities of different Government departments including DEFRA, MoD, DTI, DfT, and the co-ordination of these activities, and the support for space-related research. Written evidence is invited until Friday 13 October and oral evidence sessions will begin in the autumn.

Reports

Research Council Support for Knowledge Transfer

The Committee published its Third Report of Session 2005–06, *Research Council Support for Knowledge Transfer* (HC 995) on 15 June 2006.

The inqury was the first thematic scrutiny of Research Council activity and it focused upon the effectiveness of the Research Councils' knowledge transfer programmes. The Committee concluded that the Research Councils have an important role to play in adding value to research supported across the UK and that there is general support for the knowledge transfer schemes they have implemented. However, the Committee also found weaknesses in Research Council strategies for promotion of knowledge transfer, particularly with regard to engagement with the Regional Development Agencies and Small and Medium size Enterprises. Among the recommendations made by the Committee were the suggestions that the Research Councils share best practice in knowledge transfer and increase the number of their staff with skills and expertise in knowledge transfer.

Scientific Advice: EU Physical Agents (Electromagnetic Fields) Directive

The Committee published its Fourth Report of Session 2005–06, *Watching the Directives: Scientific Advice on the EU Physical Agents (Electromagnetic Fields) Directive* (HC 1030) on 29 June 2006.

The Report was the first of three case studies under the Committee's overarching inquiry into how the Government handles scientific advice, evidence and risk in policy making. The Committee discovered failings in the way that scientific advice was used to inform the EU Physical Agents (Electromagnetic Fields) Directives both in Brussels and in the UK. The Commission was heavily reliant on one source of advice, the International Commission on Non-Ionising Radiation Protection (ICNIRP) and in the UK there were serious failings in the consultation process. The Report recommended improvements to the way in which the Government and scientific communities can interact on European legislation.

Scientific Advice: The Classification of Illegal Drugs

The Committee published its Fifth Report of Session 2005–06, *Drug classification: making a hash of it?* (HC 1031) on 31 July 2006.

This case study addressed the relationship between scientific advice and evidence and the classification of illegal drugs. During the inquiry the Committee considered in detail the role played by, and workings of, the Government's scientific advisory committee on drug classification and policy, the Advisory Council on the Misuse of Drugs (ACMD). The Committee found a lack of transparency in areas of the ACMD's work, significant anomalies in the classification of individual drugs, and a lack of consistency in the rationale used to make classification decisions. The Committee concluded that the current classification system is not fit for purpose and should be replaced with a more scientifically based scale of harm, decoupled from penalties for possession and trafficking. Furthermore, it urged the Home Secretary to undertake a review of the current system without delay.

Scientific Advice: The Technologies Supporting Identity Cards

The Committee published its Sixth Report of Session 2005–06, *Identity Card Technologies: Scientific Advice, Risk and Evidence* (HC 1032) on 4 August 2006.

The case study focused on the Home Office's identity cards scheme, which uses various technologies including biometrics, information and communications technology (ICT) and smart cards. The Report highlighted a number of areas in which the treatment of scientific advice and evidence appears to be following good practice such as the use of advisory committees and development of risk management strategies. However, the Committee also found a lack of transparency surrounding the incorporation of scientific advice, and an inconsistent approach to scientific evidence. The Report recommended that the Home Office establish an ICT assurance committee, increase clarity and transparency across the programme and maintain flexibility regarding timescale and cost.

Government Responses

The Committee published its Fourth Special Report of Session 2005-06, *Government Response to the Committee's Second Report, Session 2005-06: Strategic Science Provision in English Universities: A Follow-up* (HC 1382) on 25 July 2006..

Further Information

Further information about the work of the Committee or its current inquires can be obtained from the Clerk of the Committee, Lynn Gardiner, 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.

Parliamentary Office of Science and Technology

Recent POST publications

Analogue to digital TV switchover

June 2006 ***POSTnote 264***

In September 2005 the Government committed to switch over from analogue to only digital television in the UK. Digital switchover will occur, region-by-region, between 2008 and 2012. This briefing updates POSTnote 233 on Digital Television and looks at the logistics of implementing the switchover and its implications.

UK Soil degradation

June 2006 ***POSTnote 265***

Soil degradation involves both the physical loss (erosion) and the reduction in quality of topsoil associated with nutrient decline and contamination. It affects soil quality for agriculture and has implications for the urban environment, pollution and flooding. Currently, 2.2 million tonnes of topsoil is eroded annually in the UK and over 17% of arable land shows signs of erosion. This POSTnote examines the nature and extent of soil degradation in the UK and the challenges and opportunities for soils in a changing climate. These include the potential for using degraded and polluted soils in the built environment for brownfield redevelopment as well as the possibility of using soils to mitigate carbon emissions.

Children's medicines

July 2006 ***POSTnote 266***

All medicines undergo clinical trials to assess their safety, quality and effectiveness. Most tests use adults; fewer than 50% of children's medicines have actually been tested in children. A new European regulation that aims to increase the development and testing of medicines specifically for use in children will become law in the UK by the end of 2006. This note examines current and future regulation of research into, and clinical trials of, children's medicines and discusses the issues raised.

Adapting to climate change in the UK

July 2006 ***POSTnote 267***

Scientists believe that a certain amount of climate change is inevitable over the next few decades, irrespective of future carbon emissions. The Government and businesses are beginning to assess what the impacts might be for the UK and to develop strategies and tools for dealing with them. This POSTnote outlines some of the impacts climate change may have and discusses remaining areas of uncertainty and debate.

Carbon footprint of electricity generation

October 2006 ***POSTnote 268***

All electricity generation systems have a "carbon footprint", that is, at some point during their life cycle carbon dioxide (CO_2) is emitted. There is some debate about how large these footprints are, especially for "low carbon" technologies such as wind and nuclear. Fossil fuelled technologies have the largest carbon footprints, because they burn these fuels during operation. Non-fossil fuel based technologies such as wind, solar and nuclear are often referred to as "low carbon" or "carbon neutral" because they do not emit CO_2 during their operation. However, they are not "carbon free" forms of generation since CO_2 emissions do arise in other phases of their life cycle such as during extraction, construction, maintenance and decommissioning. This POSTnote compares the life cycle CO_2 emissions of different electricity generation systems currently used in the UK.

Computer Crime

October 2006 ***POSTnote 269***

An increasing number of domestic and international criminal activities are taking place via the Internet and computers are now commonly used as a tool to commit crime. A personal computer connected to the Internet without protection can be infected by malicious software in under a minute, highlighting the importance of securing information systems. Two-thirds of UK businesses surveyed by the DTI reported an information security incident in 2006. This briefing provides background on the scale and nature of computer crime, technologies that are available to protect computers and highlights the key policy challenges and responses.

Data Encryption

October 2006 ***POSTnote 270***

Encryption is one technique that is increasingly used to protect digital information, from personal details stored on a computer to financial details transmitted over the Internet. This POSTnote gives an overview of encryption techniques, their reliability and applications. Encryption can enhance digital security and privacy but it may also be used to help conceal criminal activity. The briefing also discusses controversy over Government proposals to give the Police new powers to access encrypted data under the Regulation of Investigatory Powers Act, 2000.

Climate change in developing countries

October 2006 ***POSTnote 271***

Climate change poses a serious threat to development and poverty reduction in the poorest and most vulnerable regions of the world. Minimising the impacts of climate change requires adaptation. In 2005, under the UK's presidency, the G8 Plan of Action1 included an agreement to assist developing countries adapt to climate change. This POSTnote examines how adaptation to climate change is being approached in developing countries. It will also address the role of the international community and

how the UK Government is helping developing countries to build their capacity to adapt to climate change and assisting in adaptation.

Current work

Biological Sciences and Health – Avian flu, Prolonging life in newborns, Alzheimer's disease and dementia, Health inequalities, Social inequalities in health provision and Assisted reproduction technologies.

Environment and Energy – Ecosystem services, Carbon footprint of biofuels, Local air quality, Smart metering, Food security in developing countries, Siting of nuclear power plants

Physical Sciences, IT and Communications - e-Science and the Grid, Military uses of space, Computer crime, Electronic waste, Internet infrastructure and governance, Electricity infrastructure.

Science Policy – International migration of scientists and engineers, Alternatives to custodial sentencing for young adult offenders.

Fellows and interns at POST

Maria Cruz (University of Oxford) (Gulbenkian Foundation fellow) joined POST in August to assist on several current POST projects.

Sally Powell (University of Southampton) (intern) joined POST in September to work on a POSTnote on Smart metering.

Sophie Allebone Webb (Imperial College) joined POST in September to work on a POSTnote on Food Security in developing countries.

Walraj Gosal (University of Leeds) (NESTA fellow) joined POST in September to work on a POSTnote on Alzheimer's disease and dementia.

Rachel Gaulton (University of Edinburgh) joined POST in September to work on a POSTnote on Sustainable forestry in the UK.

Kaveri Harriss (London School of Hygiene and Tropical Medicine) (ESRC fellow) joined POST in October to work on a POSTnote on Social inequalities in health provision.

Barnali Ghost (1851 commission) joined POST in October to carry out background research on transmutation, wave power and micro generation.

International activities

Chandrika Nath spoke at the UNESCO Conference on Dialogue among Civilisations, Cultures and Peoples through Education and Science in Abuja, Nigeria on 19-22 June.

Amina Hossain attended the Inter-Parliamentary Information Network conference in Belfast on 19-21 July.

Jane Strachan (NERC fellow) presented a poster on her work at POST at the 5th International NCCR Climate Summer School on Adaptation and Mitigation: Responses to Climate Change on 27 August-1 September at Grindelwald, Switzerland.

The Chair, Dr Ashok Kumar MP, Board Member, Lord Oxburgh, and the Director attended the 3rd international Science and Technology in Society Forum In Kyoto, Japan on 9-11 September. Dr Kumar made a plenary presentation on the dialogue between scientists and political leaders, while Lord Oxburgh chaired a session on environmental policy.

Debates and Selected Parliamentary Questions & Answers

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

A full digest of all Debates, Questions and Answers on topics of scientific interest from 5th June to 25th July 2006 from both Houses of Parliament appears on pages 45 to 50.

Health

Ageing (S&T Report)

Debate in House of Lords on Monday 5 June

Lord Sutherland of Houndwood: More people are living longer in greater prosperity according to the first report of the Science and Technology Committee on "Ageing: Scientific Aspects". There is a need for a strategy to direct expenditure on research and its applications to the massive demographic changes in our society. Initiatives from government departments appear uncorrelated and do not amount to a strategy. The optimum situation and ideal outcome would be to live long and die fast. The Committee was advised by Professor Tom Kirkwood and addressed biomedical aspects of ageing and assistive technology. A minister of Cabinet rank should be appointed and located within the DTI. No additional funds are requested initially, but existing funds should be spent strategically, effectively, efficiently and in a manner more proportionate to the needs of society.

Lord Turnberg: Research on ageing crosses many boundaries, such as the Alzheimer's Society, British Society for Research on Ageing, the Wellcome Trust, MRC, ESRC, BBSRC and the Department of Health (DoH), though none has a prime responsibility. The Funders Forum which is supposed to bring many of these organisations together meets only rarely, has no power and is unsupported by a specific government department. The MRC and NHS R&D funds are now combining with UK Clinical Research Collaboration (UKCRC) in a new clinical research model that does

not discuss ageing, which could be devolved to UKCRC. DoH should become the lead department working with the Office of Science and Innovation.

Lord Soulsby of Swaffham Prior: The Science and Technology Committee finds the Government response deeply disappointing and lacking joined-up thinking. The Government fail to acknowledge the problems and opportunities presented by an ageing society. In reply to a question about collaboration and co-operation and progress made in research pertinent to ageing and disability, the British Society for Research on Ageing, The British Society of Gerontology and the British Geriatrics Society had all said that they "do not actually get together".

Baroness Finlay of Llandaff wished to add life to years and years to life. Adding life to years recognises that those in retirement are an enormous resource that would benefit from specific attention to technological solutions such as driving, car design, telecommunications, information technology, internet shopping, and wherever possible keeping people out of the need for healthcare by reducing the incidence of falls, which are the fifth most common cause of death in the elderly.

Lord May of Oxford noted that the Economic and Social Research Council (ESRC) only spends 1.2% of its budget on research on topics related to ageing. This is smaller than any other research council including the Engineering and Physical Sciences Research Council.

Lord Rea emphasised the importance of the nutritional environment in early life, including the intra-uterine environment and the links between healthy eating and healthy ageing that need to be better understood and communicated to the public.

Baroness Neuberger was concerned that the Government did not comment on the suggestion in the first report that since 38% of NHS expenditure is spent on the 16% of the population over 65, anything which can be done to narrow the gap between life expectancy and healthy life expectancy would free significant resources.

Lord Skelmersdale called for more support for longitudinal studies. Of the committee's 48 recommendations there are only seven agreements and eight cases where the Government recognise the importance of the recommendation in question.

The Parliamentary Under-Secretary of State, Department for Work and Pensions (Lord Hunt of Kings Heath): The Government take this work seriously and their response was intended as a positive contribution to the committee and the debate and further dialogue between the Government and the Select Committee is positively encouraged. A further response will be made in the light of this debate, specifically commenting on the points raised therein. The DWP is pivotal as a research co-ordinator, and is concerned with the Green Paper on welfare reform, which has aspirations to raise the number of working age people from 75% to 80% by encouraging older people to stay in, come into or come back to work.

Estimates 2006-07: Department of Health

Debate in House of Commons on Monday 3 July

Mr Phil Willis (Harrogate and Knaresborough) introduced the debate concerning reports from the Science and Technology Committee, Session 2004-05 on Human Reproductive Technologies and the Law and the Government's response thereto and the Department of Health report, with particular reference to the Estimate for a grant-in-aid to the Human Fertilisation and Embryology Authority. The Committee's enquiry, which began in late 2003 under Dr Gibson's chairmanship, had serious concerns about the Human Fertilisation and Embryology Authority (HFEA) and considered the Government's offer to keep the HFEA under review to be inadequate. The Government must now produce a Bill to enable creation of the new regulatory authority for tissues and embryos – RATE – from the HFEA and the Human Tissue Authority (HTA) by 2008. Areas of agreement consisted of assisted reproduction, in vitro fertilisation (IVF), and new legislation that reflects changes in public perception, with consideration being given to regulation of IVF as for other medical procedures. Other areas of agreement include the need for greater clarity in policy making by HFEA and removal of legislation on abortion from the HFEA Act. Areas of disagreement include the Government's use of the precautionary principle, and the Committee's view on the mismatch in the protection offered to an embryo *in vitro* before implantation and one at a later stage of development. This relates mainly to use of pre-implantation genetic diagnosis (PGD) which may result in a fall in demand for abortions. Very few of the 104 recommendations made by the Committee were rejected outright and the Government consulted widely to gauge professional and public opinion. The greatest area of disagreement was over the future role of Parliament in regulation.

Geraldine Smith (Morecambe and Lunesdale) indicated that PGD screening could become the ultimate form of discrimination against people with disabilities by denying them the chance to be born.

Ann Winterton (Congleton) who was chairman of the all-party Pro-Life Group for 10 years, emphasised that a child benefits from the security of a father and mother within a stable family environment and it is wrong to create a new life artificially without a mother and father.

Dr Brian Iddon (Bolton, South-East) hoped that this would be the first of many debates on the subject before the legislation is changed and hoped that it would not be hijacked by the abortion issue.

Robert Key (Salisbury): Humanity commences at 14 days with the appearance of the primitive streak, the precursor of the spinal cord, signifying cell differentiation and the beginning of sentience. Only 30%

of fertilised eggs of embryos implant in the womb, while the 70% that do not implant, are echoed throughout nature. If all human embryos are regarded as having full human status from the moment of conception and 70% of them are destroyed as ensouled human beings, does that mean that heaven is largely populated by embryos?

Dr Ian Gibson (Norwich, North): The HFEA is to merge with the HTA and asks if this is political? The British Medical Association is none too happy. We could also think of merging the HFEA and the Human Genetics Commission (HGC), Baroness Kennedy's group, which examines many issues, such as the new genetic science and its effect on disabled people. Do we need a national bioethics committee? Will Parliament really be the best place to make the big decisions? Should we stop giving such issues to quangos?

Mr Brooks Newmark (Braintree): There must now be a solid case for reconsidering the HFEA, its remit and composition, with critical failings within its IT infrastructure and its lack of a sound basis of scientific expertise, even if the status quo of lay dominance over day-to-day decisions is to be preserved. Parliament, not the HFEA is the only crucible in which these questions can be discussed fully.

Dr Evan Harris (Oxford, West and Abingdon): The report is liberalising and brave. It does not argue for a change in the 14-day limit, which is the fundamental limit in the 1990 settlement and in Warnock; it does not argue against the Warnock consensus on the gradual acquisition of rights by the embryo and foetus; and does not argue for liberalisation of abortion law.

Dr Andrew Lansley (South Cambridgeshire) was disappointed that legislation on removing donor anonymity was whipped through without a free vote, as it was later discovered that the legislation was drafted on the basis of poor evidence and those providing fertility treatments are suffering.

The Minister of State, Department of Health (Caroline Flint) was pleased that that the link between chlamydia and infertility had been mentioned, as attempts have been made to think much more closely about connections between these two issues. We should do whatever we can to prevent the likelihood of future infertility, and one of the ways we can do that is through better screening for chlamydia; another is by people practising safer sex more regularly.

Stem cell research offers enormous potential to deliver new treatments for currently incurable illnesses, such as chronic heart disease, diabetes and Parkinson's disease. In the March 2005 Budget, the Chancellor announced the establishment of the UK stem cell initiative, a task force charged with developing a vision and costing strategy to make the UK a global leader in stem cell research.

Education

Engineering Training

Debate in Westminster Hall on Tuesday 4 July

Dr Ashok Kumar (Middlesbrough, South and East Cleveland): I was practising as an engineer and was an active member of the Institution of Chemical Engineers before entering the House of Commons. I represent a constituency in the north-east with a large chemical and process engineering sector that is important for our country as well as Europe. The scientific and engineering community are pivotal to modern life, nationally and internationally. Hence Governments must play their part in training and preparing the future work force. The shortage of maths and physics teachers undermines secondary education, with teachers expected to teach subjects outside their own discipline, as only 19% of science teachers specialise in physics and only 25% specialise in chemistry. This leads to a downturn in those studying maths and physics at A-level, which underpin engineering studies, which are also down by about 30% at some UK universities. Nearly 35% of engineering companies do not expect to be able to recruit enough suitably qualified staff this year.

The Royal Academy of Engineering reported that companies have a shortage of high-calibre UK engineering graduates, and that undergraduates are not being given appropriate experience of applying theory to real open-ended problems. Undergraduate teaching needs urgent overhaul to meet the needs of industry. Private training providers such as the Teesside Training Enterprise reject 40 or 50 potential engineering trainees every year because they are over 19 years in age, which should be rectified. The specialist diploma in engineering for 14 to 19 year-olds will be available in some schools from 2008 and hopefully will succeed where the GCSE and GNVQ in engineering failed.

The Minister for Higher Education and Lifelong Learning (Bill Rammell): UK entrants to engineering courses in 2005 were up 10% in general engineering, and up by 4% in civil or mechanical engineering but fell by about 8% in electrical engineering. Action needs to be taken at all levels in the education system, and most importantly, at a much earlier stage than higher education. That is why the 14-19 agenda is so important. Engineering will be among the first five sectors to offer the employer-led specialist diplomas which provide mixed theoretical and practical learning for people of all abilities. The Chancellor made a commitment to £32 million-worth of new measures over the next two years, supported by £18 million-worth of new funding. The teacher training bursary rose to £7000 in September 2005 and will rise again to £9000 this September. The "golden hello" for new science teachers rose to £5000 for trainees entering the postgraduate certificate of education or equivalent courses in September 2005.

Energy

Wind Power

Debate in House of Commons on Friday 16 June

Dr Alan Whitehead (Southampton, Test): The UK electrical grid is likely to become a more overlapping series of grids. However, larger base load supply and grid connections will still be needed if the system is to work well into the second half of the century. An alternative is needed to connecting offshore farms in deeper waters of the North Sea to the existing UK grid by umbilical cords. This could be a new interconnector that links offshore wind farms together with linkages to the national grids in the UK, Germany and Holland. It would facilitate development of larger amounts of sustainable and clean energy, and the development of a single energy market in Europe using current technology. The electrical output could be aggregated and smoothed to produce a base load of energy from wind with minimal variability.

The Minister for Energy (Malcolm Wicks): Offshore wind could mitigate the capacity gap that the UK will face soon. The European grid is also being considered at the European level. A competitive single market for energy should be the framework within which the European energy policy is approached. The higher cost of developing offshore wind remains an issue, with grid connections amounting to 15% of capital costs for round 2 wind farms. It is expected that most of the grid connections for Round 2 projects will be direct connections to shore in Great Britain, either connecting single offshore projects or by joint connections shared by several offshore projects. The European supergrid proposal is an idea for the longer term.

Wind Energy

Debate in Westminster Hall on Wednesday 12 July

Alun Michael (Cardiff, South and Penarth): Community based wind farms can bring together the three strands of sustainable development – environmental, economic and social. Examples from Wales, Cumbria and elsewhere were discussed in some detail where community involvement, accountability and ownership had resulted in successful distributed renewable generation schemes. Embedded energy is more efficient and develops solutions tailored to local situations and attracts new skills and jobs into the social enterprise sector at the local level. The key is access to finance and a better understanding by national and local bureaucracies of how to nurture the sector's potential. A renewable heat obligation should be put in place by expressing the output of the energy industry in terms of heat and light rather than in specific forms of energy. The UK is trailing in seventh place on installed wind capacity, yet has the greatest wind resource in Europe, that is not being used adequately.

Mr David Jones (Clwyd, West): The renewables obligation is a blunt instrument. It rewards the least capital-intensive source of generation, which at the moment is wind, which will therefore proliferate until the obligation is reformed. This is a pity, because other sources of renewable power such as tidal, wave and biomass power are less visually intrusive and potentially more beneficial. If local communities want small-scale wind farms that are appropriate for their needs, they should have them.

Mr Elliott Morley (Scunthorpe): People need information about how they can become involved in developments. They need empowering so that they can get involved and they need technical support and finance. The idea of a revolving fund is a good one which the Treasury and the Department of Trade and Industry well recognise.

Dr Alan Whitehead (Southampton, Test): A very large percentage of the fuel going into big power is lost even before it has reaches the transmission cables where further loss occurs, whereas community energy produces power locally, and in the case of wind farms, 100% of the fuel in is converted to power out. Local combined heat and power generation can be 70% to 80% effective and distribution losses avoided.

Mr Alan Duncan (Rutland and Melton): In 1997 the Prime Minister promised to put the environment at the top of the agenda, but since then we have had nine years, six energy Ministers, three energy reviews and our carbon emissions have increased. I am told we have the lowest level of renewable power in Europe, Malta excepted. The problem is that the renewables obligation in its present form provides a significant incentive for building wind farms at the expense of other renewables technologies. The renewables obligation does not do enough to incentivise photovoltaic, geothermal, wave and tidal technologies, and it does not do very much to stimulate research into technologies that are still at the experimental or prototype stage, resulting in so many applications to build wind farms throughout the country.

The Minister for Energy (Malcolm Wicks): Wales is already making a welcome contribution to renewable energy targets as almost 25% of total UK onshore wind farm generation is located there. North Hoyle, our first large-scale wind farm to generate electricity offshore, has been operating successfully for more than two years. A target has been set to supply 10% of our electricity from renewable sources by 2010 and it is expected that the largest contribution will come from wind, both onshore and offshore. Last year more than 440MW of new wind capacity was built – 356MW onshore and a further 90MW offshore. A further 479MW is under construction, including the 90MW Barrow offshore wind farm. The Renewables Advisory Board has recently commissioned work on community benefits from wind power development, public engagement protocols for wind power projects and bankable models for community ownership of wind farms. I should also mention the low carbon buildings programme because some £80 million is available to spend on microgeneration. That will enable some of the ideas about co-operation to be introduced into community buildings, not least schools.

UK Parliament - Digest of Parliamentary Debates, Questions and Answers 5th June – 25th July 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 41 to 44.*

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http://www.publications.parliament.uk/pa/cm/cmwib.htm

Euro-News

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

International Thermonuclear Experimental Reactor (ITER) construction agreed

The ITER is the word's largest scientific project and the partners ended years of negotiation on 24 May 2006, by agreeing to start construction of the fusion reactor at Cadarache, France in 2007. The project brings together the EU, China, India, Japan, Russia, South Korea and the United States, together representing more than half of the world's population in an ambitious attempt to investigate fusion as a new source of energy, in theory both green and limitless. The reactor will reproduce the fusion reaction that occurs in the Sun and stars. When the nuclei of small atoms come together at very high temperatures, they fuse, producing huge amounts of energy. To recreate this effect on Earth, the reaction needs temperatures above 100 000 000ºC. At these temperatures, solid structures would be instantly vaporised. Powerful magnetic fields keep the particles away from the walls of the container to prevent any vaporisation and to minimise heat loss.

Better opportunities for SMEs in FP7

SMEs are vital to the European economy, with approximately 25 million of them accounting for close to two thirds of Europe's employment and GDP. In the Sixth Framework Programme (FP6) just 22% of SME proposals considered to be of a very high standard received funding whereas a total of 50% of projects of that standard received funding. The current EU contribution to industry participants is 50% of the total cost of the project. Under FP7 proposals designed to increase SME participation include simplification of the rules, procedures and administration for applicants. The EU contribution would increase to 70% for projects involving SMEs.

Commission calls for overhaul of university system

Europe's education systems remain hampered by obstacles, many of which are decades old. Nine new proposals have been prepared by the Commissioner for Education and Training, Jan Figel. These should include students spending at least one semester abroad; access to national loans and grants wherever students study or undertake research in the EU; harmonisation of EU degrees which are aligned with professional qualifications; research career training in intellectual property management and team working; greater participation for older people; best students given access to support schemes regardless of background; review of university funding systems; and give universities more autonomy in developing curricula and in selecting teaching and research staff.

Security research in FP7

This is the first time that security research has had a budget of its own within the EU's research programmes, with appeals for EU spending on security research to treble to €300 million as soon as possible. European security research should contribute to the development of telecommunication systems on the basis of common standards. The next generation of reconnaissance satellites should therefore be a common European system, open to all Member States at the European Satellite Centre in Torrejon, Spain.

EU and south-east Asia discuss ICT

Both parts of the world have a lot of good researchers, and sharing results is of utmost importance for progress in both directions. For example, at Singapore's national library users are able to download available e-books in a pdf format, or onto their personal digital assistants. The e-books are encrypted so that if they are not "returned" before the due date, they will automatically expire and be unreadable. Users are unable to print the books.

European Institute of Technology (EIT) timetable develops

The League of European research Universities (LERU) has previously been strongly critical of the EIT concept, but welcomed the latest communication on the proposal which allows for far greater flexibility in the way that the knowledge communities will operate. However LERU remains sceptical about the plan for the EIT to award its own degrees, and still has the concern that the ERC will lose funding to the EIT. An impact assessment will be presented later this year followed by a formal proposal that will cover issues such as the location of the Governing Board and the institute's budget. It is hoped that the legal instrument establishing the EIT will have been brought into application by 2008. The Governing Board will then be appointed in early 2009, allowing the first knowledge communities to be identified and set up in time for the 2009/10 academic year.

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).

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Intellectual Property
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The Chartered Institute of Patent Attorneys
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Large-Scale Research Facilities
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PPARC

Lasers
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Marks and Spencer

Satellite Engineering
University of Surrey

Science Policy
ABPI
Academy of Medical Sciences
Biochemical Society
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
Natural England
Royal Botanic Gardens Kew

Statistics
Royal Statistical Society

Surface Science
CCLRC

Sustainability
British Ecological Society
CABI Bioscience
Cefas
University of East Anglia
Environment Agency
Institution of Chemical Engineers
Institution of Civil Engineers
London Metropolitan Polymer Centre
Natural England
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
Institute of Biology
Natural England
UFAW

Association of the British Pharmaceutical Industry

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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

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

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

Academy of Medical Sciences

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The Academy of Medical Sciences promotes advances in medical science and campaigns to ensure these are converted as quickly as possible into healthcare benefits for society. The Academy's eight hundred and fifty 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

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AIRTO represents the UK's independent research and technology sector - member organisations employ a combined staff of over 10,000 scientists and engineers with a turnover in the region of £1.5 billion. Work carried out by members includes research, consultancy, training and global information monitoring. AIRTO promotes their work by building closer links between members and industry, academia, UK government agencies and the European Union.

Biochemical Society

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

Biotechnology and Biological Sciences Research Council

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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 Innovation. 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

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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

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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

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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

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The British Psychological Society is an organisation of over 42,000 members governed by Royal Charter. It maintains the Register of Chartered Psychologists, publishes books, 10 primary science Journals and organises conferences. Requests for information about psychology and psychologists from parliamentarians are welcome.

British Society for Antimicrobial Chemotherapy

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

British Veterinary Association

BVA

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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

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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

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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

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

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

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

High Energy Physics: 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

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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 Attorneys

Founded 1882 Royal Charter 1891

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CIPA's members practise in intellectual property, especially patents, trade marks, designs, and copyright, either in private partnerships or industrial companies. 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

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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

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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

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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

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The ESRC is the UK's leading research and training agency addressing economic and social concerns. We pursue excellence in social science research; work to increase the impact of our research 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

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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.

Environment Agency

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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

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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

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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

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

Institute of Biology

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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

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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

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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

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IPEM is a registered, incorporated charity for the advancement, in the public interest, of physics and engineering applied to medicine and biology. It accredits medical physicists, clinical engineers and clinical technologists through its membership register, organises training and CPD for them, and provides opportunities for the dissemination of knowledge through publications and scientific meetings. IPEM is licensed by the Science Council to award CSci and by the Engineering Council (UK) to award CEng, IEng and EngTech.

IChemE

Institution of Chemical Engineers

IChemE is the hub for chemical, biochemical and process engineering professionals worldwide. We are the heart of the process community, promoting competence and a commitment to sustainable development, advancing the discipline for the benefit of society and supporting the professional development of over 25,000 members.

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Institution of Civil Engineers

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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.

Institution of Engineering and Technology

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

LGC

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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

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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

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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

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

We have over 450 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

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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

Merck Sharp & Dohme Research Laboratories

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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

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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

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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 England

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Natural England is the Government's conservation agency working throughout England; we conserve, enhance and manage the natural environment for the benefit of current and future generations. We commission research and publish papers which underpin the development of our policies and programmes.

Natural Environment Research Council

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

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

British Antarctic Survey, British Geological Survey, Centre for Ecology and Hydrology, National Oceanography Centre and Proudman Oceanographic Laboratory

Newcastle University

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Website: www.ncl.ac.uk

Newcastle University 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

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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

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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

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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

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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

PLANTS PEOPLE POSSIBILITIES

ROYAL BOTANIC GARDENS KEW
WORLD HERITAGE SITE

KEW GARDENS

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.

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SAVING THE WORLD'S PLANTS FOR LIFE

The Royal Institution

Ri The Royal Institution of Great Britain

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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

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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

RSC Advancing the Chemical Sciences
The Royal Society of Chemistry

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The Royal Society of Chemistry
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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

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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

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Chief Executive Officer
The Science Council
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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

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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

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

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

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

Society of Chemical Industry

SCI
where science meets business

Contact: Andrew Ladds,
General Secretary and Chief Executive
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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

FOUNDED 1948
SCS
SOCIETY OF COSMETIC SCIENTISTS

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Secretary General
Society of Cosmetic Scientists
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Website: www.scs.org.uk

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

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

University of Surrey

UniS
University of Surrey

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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

UFAW
Established 1926

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Scientific Director
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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.

Parliamentary and Scientific Committee News

Sir Ian Lloyd

Sir Ian Lloyd, President of the Committee 1990-92 and a regular contributor to this journal, sadly died on 26th September.

New Members

We are delighted to welcome two new members: **Mr Willie Rennie MP** and the **Engineering Professors' Council.**

The Universities Federation for Animal Welfare (UFAW), in conjunction with the British VeterinaryAssociation (BVA) Ethics Committee, held a major international animal welfare symposium, "Quality of Life: the heart of the matter" at the Royal Society on 13th and 14th September. Seen here at a reception held for the delegates in the House of Commons on 13th September are Dr Doug Naysmith MP and Lord Soulsby, Chair of the BVA Ethics Committee.

Science Diary

The Parliamentary and Scientific Committee

Contact: Annabel Lloyd
020 7222 7085
www.scienceinparliament.org.uk

Monday 23 October 17.15
Extraordinary General Meeting
Followed by
How Can Science Help to Save the Marine Environment?
Speakers: Professor Ed Hill, Director, National Oceanography Centre, Southampton
Dr Carol Turley, Head of Science, Plymouth Marine Laboratory
Mark Farrar, Chief Executive, Cefas

Wednesday 8 November 8.30
Breakfast Briefing: Satellites for Science, Engineering, Technology and Business
Speakers: Prof John Zarnecki, PPARC and Open University, Planetary and Space Sciences Research Institute
Sir Martin Sweeting, Surrey Satellite Technology
Colin Paynter, Managing Director. EADS Astrium Ltd

Monday 20 November 17.30
Are Patients Safe with the NHS?
Speakers: Dr Bill Murray, Acting Chief Executive, National Patient Safety Agency
Professor Tom Treasure, General Thoracic Surgeon, Guy's Hospital
Professor Peter Buckle, Robens Centre For Health Ergonomics, University of Surrey

Tuesday 28 November 10.00-14.30
Visit to NPL

Monday 4 December 17.30
Materials, Minerals and Mining – Innovation, Conservation and Wealth Creation
Speakers: Professor Robert Pine, Camborne School of Mines, University of Exeter
Dr Stuart Lyon, University of Manchester, Immediate Past-President Institute of Corrosion
Professor Colin J Humphreys, Department of Materials Science and Metallurgy, University of Cambridge

Monday 15 January 2007 17.30
Conflicts of Interest
Speakers: Dr Richard Smith, Chief Executive, UnitedHealth Europe
Sir Iain Chalmers, James Lind Library, Oxford
Professor Clive Wilson, Strathclyde University and and Royal Pharmaceutical Society of Great Britain

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The Royal Institution

Due to refurbishment, all Ri events are to be held at external venues throughout 2006 and into 2007. See www.rigb.org or telephone 020 7409 2992 for full details and to book tickets.

Friday 20 October 19.30
From chemicals to consciousness
Baroness Susan Greenfield
University College London

Wednesday 25 October 19.00
Something in the genes: Walter Rothschild, zoological collector extraordinaire
Victor Gray
The Royal College of Surgeons of England

Thursday 9 November 19.00
Ageing inside out
Prof Tom Kirkwood
The Institute of Physics

Wednesday 15 November 19.00
William Shockley: creator of the electronic age
Joel Shurkin
Science Oxford

Friday 17 November 19.30
The rediscovered Hooke folio: what happened next
Prof Lisa Jardine
University College London

Tuesday 21 November 19.00
Alchemy: the occult beginnings of science
Dr Philip Ball, Dr Peter Forshaw and Prof William Newman
The Royal College of Surgeons of England

Friday 24 November 19.30
Bending minds: how technology can change who you are
Dr Martin Westwell
University College London

Thursday 30 November 19.00
Bright ideas: solar energy and carbon reduction
Dr Kevin Anderson and Prof David Cahen
The Institution of Engineering and Technology

Friday 15 December – Friday 22 December
Royal Institution Christmas Lectures: 'THE NUM8ER MY5TERIES'
Prof Marcus du Sautoy

Friday 15 December 17.00
The curious incident of the never-ending numbers

Saturday 16 December 17.00
The story of the elusive shapes

Monday 18 December 17.00
The secret of the winning streak

Wednesday 20 December 17.00
The case of the uncrackable code

Friday 22 December 17.00
The quest to predict the future

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.
Highlights in the next few months include:

Monday 30 October 18.30
Constructing the nervous system: stem cells to synapses
Royal Society Rosalind Franklin prize lecture
Professor Andrea Brand

Monday 13 - Tuesday 14 November (all day)
The biogeochemistry of trace gases and their role in driving global change
Professor David Beerling, Professor CN Hewitt, Professor John Pyle FRS and Professor John Raven FRS

Please see www.royalsoc.ac.uk/events for the full events programme, more details about the above highlights and web casts of past events.

The Royal Academy of Engineering

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

Tuesday 13 February 2007
ECRR Peter Wilson Lecture
Does Science Matter?
Professor Anne Glover, Chief Scientific Adviser for Scotland

SCI

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

Wednesday 1 November
Reach - Impact of New Chemical Control Regulations

Tuesday 7 November
2nd International Membrane Chromatography Conference

Monday 13 November
Green Product Design

Tuesday 14 November
Process Engineering Workshop

Tuesday 28 November
Plant Derived Natural Products
at Syngenta, Bracknell, UK

Tuesday 28 November
Nociception: Taking the Pain out of Drug Discovery

Wednesday 29 November
Colloids in Coatings

Friday 1 December
YCP Review meeting - Contemporary Catalysis in Organic Synthesis

Wednesday 6 - Friday 8 December
24th Process Development Symposium
at Churchill College, Cambridge

Thursday 7 December
Blood, Sweat and Bouncing Balls

Tuesday 12 December
McBain Medal Award Symposium

Thursday 8 February 2007
Green Product Design

Thursday 15 February
Industrial and Commercial Flooring

Royal Pharmaceutical Society of Great Britain

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

Monday 6 November
Principles of Pharmacy Education
A Joint Symposium of the Academy of Pharmaceutical Sciences, the Academic Pharmacy Group and the Royal Pharmaceutical Society of Great Britain
Riverbank Park Plaza, London

Monday 27 - Wednesday 29 November
Tabletting Technology for the Pharmaceutical Industry
Moller Centre, Cambridge

Monday 19 – Wednesday 21 February 2007
Stability testing of pharmaceuticals
Moller Centre, Cambridge

Officers of the Parliamentary & Scientific Committee

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

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ice
Institution of Civil Engineers

The State of the Nation 2006

An assessment of the UK's infrastructure by the Institution of Civil Engineers

The State of the Nation report is compiled each year by a panel of experts from the Institution of Civil Engineers (ICE) to stimulate debate and to highlight the actions that we believe are needed to improve the UK's infrastructure.

This year's report is launched on
17 October 2006

To view the full report please visit
uk-infrastructure.org.uk

About ICE

The Institution of Civil Engineers (ICE) is a global membership organisation that promotes and advances civil engineering around the world.

ICE is a leading source of professional expertise in transport, water supply and treatment, flood management, waste and energy. Established in 1818, it has around 80,000 members throughout the world.

For further information on
The State of the Nation contact ICE:

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