Spring 2006

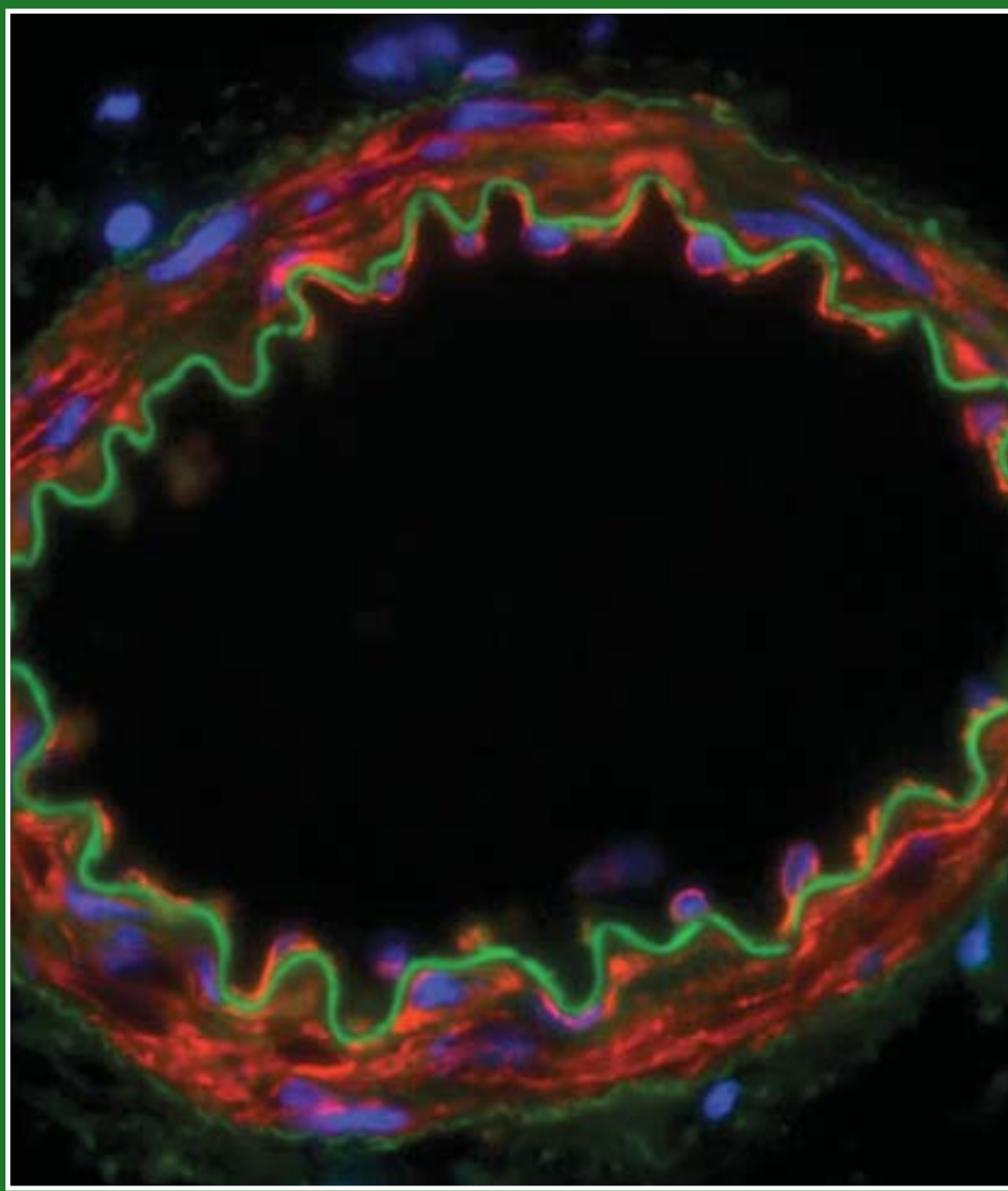
SCIENCE IN PARLIAMENT

Complementary and Alternative Medicine

The Precautionary Principle

The Green Revolution

SET Helping Africa



75th Anniversary of British Pharmacological Society

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

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

Martin Rees notes the low participation in science by 16 and 17 year-olds and reductions in A-level physics, chemistry and maths. Deirdre Hutton presents a Science Strategy for the Food Standards Agency. Mark Walport welcomes a vibrant research environment protected by risk management. Robert Souhami attacks the confused legal and regulatory guidance that is stifling the use of electronic personal health care records in NHS research. Ursula Roos promotes UK-German bilateral collaboration especially in climate change and energy. John Walton recommends that doctors refer patients for CAM therapy on the NHS and Stephen Holgate encourages integrated health care using the science and art of medicine while David Tredinnick promotes complementary medicine from both personal and public viewpoints. Norman Borlaug's plant breeding research provides "a temporary success in man's war against hunger and deprivation" and a breathing space in which to deal with the "population monster". Sue Owens describes the evolution of the precautionary principle (PP) in the RCEP while Colin Berry describes erratic, arbitrary and non-scientific applications of the PP, and Ragnar Lofstedt traces the PP from Swedish origins, but predicts that the cost of regulation will outweigh the benefits. Crispin Tickell concludes that the most sustainable action possible is to help Africans to help themselves and Frank Rijsberman recommends investment in water, while Richard Carter considers that Africa is in need of support that exceeds even the most imaginative that science and technology can deliver, and Gordon Conway makes water and sanitation targets a priority for DFID. The British Pharmacological Society celebrates its 75th birthday. Novartis Pharmaceuticals promote living donation of kidneys. Paul Hardaker says hurricanes have increased in intensity over the last 30 years.

Dr Brian Iddon MP
Chairman, Editorial Board
Science in Parliament

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Image on front cover: Cross-section of an artery labelled for potassium channels (red), with elastic wall (green) and cell nuclei (blue) shown. Dr Matthew Burnham and Professor Arthur Weston, Faculty of Life Sciences, University of Manchester

Keeping UK Science world class

Lord Rees of Ludlow PRS

Science, engineering and technology make ever more pervasive contributions to our lives. Science and its applications can improve the quality of life and the prosperity in this and every nation; they also confront us with a range of new risks, and difficult policy issues. The UK is an international leader in science, as the annual statistics published by the Office of Science and Technology illustrate. On most measures of productivity and impact, this country is second to the world leader, the United States. But two worrying trends threaten to undermine our position in the world league of science: declining popularity of chemistry, maths and physics among A-level students, and relatively low levels of public and private investment in research and development.

Recent surveys show that the United Kingdom compares well with other countries in terms of participation and performance in science education at school level up to the age of 16. But after the age of 16, our record appears to deteriorate. We have one of the lowest participation rates in education for 16 and 17 year-olds (ahead only of Italy among the G7 nations). And entries in chemistry, physics, biology and mathematics accounted for only 22.9% of A-level entries in all subjects by students in England, Wales and Northern Ireland in 2005.

What is more, participation rates in the sciences and mathematics have been deteriorating: they accounted for 30.0% of all A-level entries in 1991. Between 1991 and 2005, the total number of A-level entries in all subjects increased by 12.1%. But over that period, the number of entries in physics, chemistry and mathematics declined by 35.2%, 12.6% and 21.5% respectively. Not all of the sciences have shown a downwards trend, with entries in biology rising by 15.8%, and increases in other newer subjects such as computing. It is not clear how the performance of UK students currently compares with those in other countries, but hopefully the Government will be successful in persuading enough English schools to be included in an international comparison exercise this year to provide representative figures.

Clearly if our universities and businesses are to be internationally competitive in the physical sciences, we will need to ensure sufficient numbers of talented young people emerge from our schools with career ambitions and qualifications in those disciplines. I hope that the new GCSE curriculum for science, which will be introduced next September, will encourage more pupils to study the sciences and mathematics at A-level. But further measures will be needed, such as tackling the shortages of suitably qualified teachers in those subjects. The scientific community, the Government and our schools will need to work together if the downward trends are to be reversed.

Ensuring the flow of well-qualified scientists and engineers into the workforce is also a key part of tackling the other weakness in the UK's performance in science, engineering and technology: the amount invested in research and development. UK gross expenditure on research and development in 2003 was equivalent to 1.89% of gross domestic product. This figure was lower than in the early 1990s and puts the UK in 14th place in the international league table of OECD members.

Much public money has been invested in science in recent years, but the government-financed proportion of gross expenditure on research and development in the UK, as a proportion of GDP, in 2003 was 0.59%. This was well below the OECD and EU-25 averages, and placed us 16th in the OECD league table. Industry-financed gross expenditure on research and development, as a proportion of GDP, in 2003 was 0.83%, also below the OECD and EU-25 averages and producing a ranking of 17th in the OECD.

Recognising our poor performance, the Government's 10-year framework for science and innovation has set an ambitious target of raising UK gross expenditure on research and development to 2.5% of GDP by 2014. This target can only be achieved if there is sustained investment by both the public and private sector.

Science, engineering and technology provide the base for the economic performance of the UK and its competitors in the international community. The UK has an outstanding track record in world science. We must maintain our momentum: success should breed further success; we need to become still more successful in attracting and nurturing mobile talent. But there are now some fundamental weaknesses which could undermine our position. It is up to policy-makers and the science community to see that these problems are tackled so that the UK in the future can continue to reap the benefits of being a world leader in science, in an era when we find growing competition from the Far East, as well as from across the Atlantic.

Lord Rees of Ludlow is President of the Royal Society, the UK national academy of science.

OPINION

Dr Brian Iddon BSc, PhD, DSc (Hull), FRSC, CChem, MP

Chairman of the Editorial/Management Board of Science in Parliament. Member of Parliament for Bolton, South East, since 1997, Treasurer to the Parliamentary & Scientific Committee and formerly Reader in Organic Chemistry in the Department of Pure & Applied Chemistry at the University of Salford.

It is a great privilege to succeed Dr Doug Naysmith, MP for Bristol North West, and I would like to thank Doug for developing *Science in Parliament* over the past five years as a successful and authoritative magazine and assure him of my very best wishes in his new role as Chairman of The Parliamentary & Scientific Committee.

My enthusiasm for chemistry started at age 11 when I acquired a set of apparatus and chemicals along with "recipe books" from an older boy in my village on the West Lancashire Plain. I entertained audiences at home and abroad for 29 years with a popular 90-minute lecture called "The Magic of Chemistry". This included an appearance on Alan Titchmarsh's lunchtime show from Pebble Mill performing "live" experiments in the presence of other guests, including Raymond Baxter and other presenters from successive Tomorrow's World teams. This culminated on 5 November 1997 when, dressed as Guy Fawkes, I legally exploded gunpowder in the Houses of Parliament, when presenting extracts from that lecture in the Jubilee Room!

I previously served on Bolton Metropolitan District Council as a Councillor for 21 years and for ten of these as Chair of the Housing Committee. This generated ambitions to push for a higher profile for housing in Westminster, although science and technology policy have now reasserted themselves as my major interest. I became a founder Member of the Environmental Audit Select Committee in November 1997 and a Member of the Science & Technology Select Committee in March 2000. I am an Honorary Adviser in the House to the Royal Society of Chemistry and an Honorary Member of the Society of Chemical Industry. I also Chair the Board of Directors of Bolton Technical Innovation Centre Ltd, which appears to be the first junior incubator in the country (see *Science in Parliament, Autumn 2005* for more details).

This is an exciting time for scientists, especially as we have a Government that is committed to science and technology, and the wealth and well being that this can bring to our fellow citizens and others in developing countries. 2005 was the year when the focus was on climate change and natural disasters and our interest in these will be maintained. Important debates during the next twelve months will include energy, when the Energy Review is completed. The Human Fertility and Embryology Act is currently under review. Other exciting issues include the Galileo Project that prompts the question whether Europe will now begin to predominate with advances in space research?

However the most important people of all are the readers of and contributors to *Science in Parliament*. Our editorial team, the Editorial/Management board and Professor Peter Simpson and Mrs Annabel Lloyd are always interested to receive both criticism and comment on further improvements to this increasingly valuable publication and all the above are thanked for their important contributions. *Science in Parliament* is published four times a year and reports on meetings of the Parliamentary and Scientific Committee and other events in Parliament including Members' contributions in both Houses, where science is covered in the broadest possible sense with important inputs from engineering, technology and medicine.

OPINION

Information for Health

Mark Walport
Director, The Wellcome Trust

The use of computers to store, analyse and disseminate information is changing our lives, for better or worse (or realistically for better and worse!). New and important service industries are developing to take advantage of the commercial potential of this advance in technology. A huge challenge for governments is how to use, regulate and disseminate the avalanche of information about the lives of each and every one of their citizens.

Why is this topic relevant to the Wellcome Trust? Our mission as a major biomedical research charity, spending about £430 million each year, is to "foster and promote research with the aim of improving human and animal health". One important way of advancing this mission is to support research that uses information gathered from individuals and populations about interactions between health, the environment and genes. That is why we are funding the UK Biobank project in partnership with the MRC, the Department of Health and the Scottish Executive. Professor Rory Collins of Oxford University is leading this project, which will study over many years how the health of 500,000 people aged between 40 and 69 is associated with environmental and genetic factors.

No government or political party can afford to duck the issue of how to use information in a digital age, as good public policy demands the use of

objective evidence that can only be gathered by the systematic use of information. For obvious reasons I will advance my arguments around use of information in the field of health, but many of the principles apply equally to other fields such as transport, housing and education.

As a junior doctor, much of my time used to be taken up looking for lost X rays and blood test results, and repairing broken files of clinical records or creating new ones when the old had been lost. Much harm has been caused by the inefficiencies of record keeping using old methods, for example repeat X rays, drug prescription errors and misdiagnoses. We should therefore celebrate the initiative in the NHS's "Connecting for Health" which aims to integrate IT infrastructure and systems. One aspect of this will be the provision of an individual electronic care record for all England's 50+ million users, securely accessible to patients and their carers.

But, if we are to treat people better in the NHS, we need to be able to use these data for research. Indeed, a typical family may have as many as seven points of contact with national and local government agencies such as the NHS, Department of Work and Pensions, Inland Revenue, local councils and local schools. Increased linkage, access and the effective use of these data resources including their eventual linkage to personal care records would be invaluable to public policy development. For example, it is important that the NHS can understand and address health inequalities, and develop disease registers to improve delivery of care. Achieving this requires linking data on health, housing, employment and other measures of socio-economic status. These benefits will only materialise if these data can be shared and used for research.

The public and opinion formers can be wary of such initiatives. Understandably, there are concerns about the protection of personal information and privacy issues. A recent study, commissioned by the Council for Science and Technology highlighted many of these concerns, but also indicated that, as long as personal confidentiality is protected, the public wants data used in relation to health research[1]. Government does not always help its own case – for example current publicity from the DWP in relation to benefit fraud states:

"We can compare information across Government Departments.[2] So if you're not completely honest, we will find out."

Use of such "Big Brother" style messages could seriously undermine public confidence and lead to resources of unique value being put out of reach of policy makers and academic researchers.

Responsible data sharing, access and data management are key to a vibrant research environment, allowing the exchange of ideas and research findings. There needs to be a regulatory and governance framework that minimises and manages the risks associated with such initiatives and one that inspires public confidence. Public engagement will be key to this, helping to ensure that Government achieves real benefits from data-sharing.

Technological change is not only affecting what research resources academics have access to for their studies but how the findings of their research are published. I argue that data must wherever possible be freely disseminated, subject to stringent safeguarding of data that could provide confidential information about individuals. Here the publication of the results of research is key. Not everyone shares this view – a publisher, responding to questions from the House of Commons Science and Technology Select Committee inquiry into open access publishing, stated:

"Speak to people in the medical profession, and they will say the last thing they want are people who may have illnesses reading this information, marching into surgeries and asking things. We need to be careful with this very, very high-level information."[3]

This statement implying that "knowledge is power" reinforces greatly my view that people who have illnesses should have access to every single element of this "very, very high-level information"! Indeed, the Wellcome Trust has had a long standing interest in ensuring free access to and rapid availability of research information to maximise the utilisation of research outputs and thereby their benefits to society. These principles were enshrined in

an agreement concerning the data emerging from the Human Genome Project. All information produced by the public-funded project was made immediately and freely available to everyone, via the Internet, with no restrictions on how it could be used. This immediate information release maximised the utility of the data to research scientists in both academia and industry.

With recent advances in Internet publishing, we are seeking to encourage initiatives that broaden the range of opportunities for the results of quality research to be widely disseminated and freely accessed by the reader anywhere in the world. It is now a condition of our funding that a copy of any original research paper published in a peer-reviewed journal must be deposited into subject-specific public access repositories, so that it is available to be read for free immediately or no later than six months after publication. We will provide the funds to enable this to happen.

Current and future technological advances are transforming the way we hold, access and use information. We must collectively engage the public and opinion formers to explore and communicate the benefits and risks associated with these advances and ensure a balanced regulatory and governance framework is established. A more streamlined, co-ordinated and coherent approach towards the personal data sets held across government departments could provide enormous benefits to individuals, society and to Government itself.

[1] Better use of personal information: opportunities and risks. Council for Science and Technology. November 2005.
[2] http://www.targetingbenefitfraud.gov.uk/on_to_you.html
[3] http:www.publications.parliament.uk/pa/cm200304/cmselect/cmsctech/399/4030102.htm

OPINION

Taking a Risk

Dame Deirdre Hutton CBE
Chair, Food Standards Agency

A neighbour swears blind that he caught food poisoning from a favourite local restaurant: do you ever book a table there again? A close relative suffers a heart attack, despite being a health food fanatic: do you shelve those intentions to go on a diet? Bird 'flu hits the news: do you throw out the chicken breasts you bought yesterday?

When making choices like these, first-hand experience and scary headlines are as much a part of the mix as any dispassionate assessment of the risks. For an impartial, evidence-based organisation like the Food Standards Agency, that means we have to look constantly for more persuasive ways to convey what we know and learn about food risks.

Our starting point is to distinguish clearly between the twin tracks of weighing up the risk, and working out what, if anything, should be done about it – the "what" and "how" of effective public protection. The recent switch to a BSE testing regime is a good example. An independent risk analysis justified allowing older cattle back into the food chain, subject to a negative test. But it was only right to do so having earned public trust and acceptance through open engagement and honesty about what we knew – and what we didn't know – about the risks.

This example is typical of the sort of issue that faces the Agency and earlier this month, in open session, the FSA board discussed three measures to ensure our risk assessments continue to be made using the best available scientific evidence and impartial expert judgement.

First, a new Science Strategy for the next five years was considered. Following consultation with leading scientists from across the country, the Strategy re-emphasises the importance of gathering and using existing authoritative evidence, and focuses our own research resources on filling in where there are gaps or uncertainties.

Second, an enhanced role for our Chief Scientist was discussed, emphasising responsibility for "quality assurance" in the way the Agency gathers and uses scientific evidence.

Finally, the role of our nine Scientific Advisory Committees was reviewed. In common with other public protection bodies, we rely on a framework of expert committees for independent scientific advice. To make better use of this expertise, we discussed ways to improve the dialogue between the committees and the Agency's board – without compromising the scientists' integrity in risk analysis or the board's responsibility to make risk management decisions.

A public meeting last October provided a taster for the way forward when Professor Alan Jackson joined Board Members around the table. Professor Jackson chairs the Scientific Advisory Committee on Nutrition (SACN) and Board Members grilled him on his committee's endorsement of a "nutrient profiling" model developed by the Agency – a system for scoring foods according to their composition intended to help Ofcom regulate television advertising of food to children. It was an opportunity to give a public airing to differences of opinion on aspects of nutrient profiling – a tool used widely within the food industry – and to arrive at a final policy decision that is based, transparently, on the judgement of the leading experts.

Work is also under way to develop the Agency's understanding of the appetite for risk across a hugely diverse population – to help us draw the line in the right place, to paraphrase Lord Phillips. Better regulation will follow from a better understanding of the personal cost-benefit analyses that people make when deciding on their own individual trade-offs between safety, convenience, cost and enjoyment.

Physical, chemical and life sciences may define what a risk is, but social, economic and behavioural sciences help determine how you deal with it.

Back in October, the FSA and the Royal Society brought senior social scientists together with scientific experts from our advisory committees to discuss how to accommodate social, cultural and environmental factors into risk assessment.

For some risks, like BSE or food poisoning, legislative powers will remain a necessary option. But for others, such as poor diet, powers of persuasion are likely to be more effective. Whenever possible we rely on giving people the information that allows them to make up their own minds. For example, by raising awareness of the risks of eating too much salt, or by providing clear, simple dietary information on the front of packs of processed foods to help with decisions about what to eat more or less of.

For the Agency, this means further advances in openness, transparency, and clarity of language if we are to help people make safer, healthier choices based on the risks rather than on random misfortune. The more people understand food risks, the more chance they will enjoy what they choose to eat and worry about it less.

Personal data for Public Good

A new report from the Academy of Medical Sciences on the use of personal health information in medical research

Professor Robert Souhami CBE FMedSci
Chairman of the Academy Working Group

Research using information from personal health records provides much of the evidence on which improvements in health care are based. Population-based research of this kind has shown the long-term effects of treatment, identified causes of disease, indicated how epidemics might be controlled and how delivery of health care can be improved. The UK has long been a leader in this field. With the proposed introduction of electronic health care records, and the unifying health care system provided by the NHS, the opportunities for research to improve health are now unique in size and scope.

But just at the time when the UK could forge ahead we have inhibited the development of this research through a combination of confused legal and regulatory guidance, an insistence on personal privacy and autonomy that is out of all proportion to any risk, and a stifling bureaucracy of process.

The Academy of Medical Sciences identified this problem in its 2003 report *Strengthening Clinical Research* and subsequently set up a Working Group to examine the present and future position in the UK with respect to the use of personal data in medical research. Our report *Personal data for public good: using health information in medical research* has just been published.

Such research requires access to large and representative populations. Two examples from cancer registration show how lack of access, or bias in the nature of the population studied, can lead to misleading claims or cost lives:

It is often stated that outcomes of cancer treatment are better in France than in the UK. This has no firm basis in fact because there is no systematic registration of cancer in France so the number of new cases, and the populations affected, are uncertain. Comparisons of national cure rates are therefore extremely unreliable.

A decision by the Hyogo prefecture in Japan to stop cancer registration, because of concerns about privacy, delayed the detection of increasing deaths from mesothelioma (cancer of the lining of the lung caused by asbestos). Registration has been belatedly reintroduced.

The research in question uses data from the routine records of patients. (We did not consider interventional research such as therapeutic trials or invasive investigation.) The great advantages of routine health records are that the information is based on current routine clinical practice, large numbers of patients can be included covering all social groups, and there can be rapid incorporation of the findings into routine clinical care.

The use of health data is legal if the persons concerned have given informed consent or if all the identifiable data have been removed (fully anonymised data). But informed consent or anonymisation are frequently not possible, or would undermine the validity of the results. The following examples show why this is so.

Double counting is a real risk: *Congenital anomaly registers were set up in response to the thalidomide tragedy and are essential in identifying teratogenic exposure in pregnancy. Many of the defects come to light later in life so data must be collected from databases held by paediatricians, midwives, genetic counselling services and many other sources. The individuals must be identifiable because otherwise they are very likely to be counted two or more times.*

Long term studies need to accrue additional data: *If a population is to be studied over many years (essential for determining outcomes of exposures or treatments) new data concerning events in individuals cannot be added if the data are irretrievably anonymised.*

It may be completely impractical to obtain informed consent: *The hypothesis that adverse conditions in pregnancy might increase the likelihood of cardiovascular disease in later life was developed and tested by Professor Barker using over 15,000 birth records collected in Hertfordshire from 1911 onwards. 3000 patients had died and the population had dispersed. The results linked low birth weight with risk of hypertension, type II diabetes and other disorders in adult life.*

Seeking consent may sometimes bias the data: *Until 2001 there was controversy over whether termination of pregnancy increased the risk of breast cancer. A potential bias was that women who had developed breast cancer might be more likely to disclose*

information about termination than women without cancer. When a data linkage study was done without consent the absence of risk was demonstrated conclusively.

Research therefore often needs to use identifiable data without consent. But this is where the problem lies. The law in this area is now notoriously complicated. It includes the Data Protection Act (DPA) 1998, the Human Rights Act 1998, the Health and Social Care Act 2001 and the common law of confidentiality. Most of the legislation is concerned with wide-ranging issues of confidentiality and privacy in public life of which medical research is just one aspect. Nevertheless, exceptions and schedules have been included within these laws specifically to allow the use of data without consent in the public interest. The key point is that the use must be proportionate with regard to the benefit and the possible risk. To date there has been no common law judgement with respect to medial research. The Working Group considered that, however desirable a change in legislation with respect to medical research might be, this was impractical for the immediate future and risked making matters worse.

The view of the Academy therefore is that present laws do not prohibit this type of research and we recommend that this interpretation should underpin the regulatory guidance.

The mass of legislation is interpreted by each of the numerous regulatory authorities that lie in wait for the researcher. These include the Office of the Information Commissioner (OIC), the Patient Information Advisory Group (PIAG), regional and local ethics committees, the General Medical Council, the Department of Health research governance framework and the R&D offices of NHS Trusts. Many researchers gave us instances where it had been difficult or impossible to penetrate the regulatory maze, to respond to the conflicting advice and interpretation of the law, and to surmount the slow, frustrating, bureaucracy that envelops a research proposal.

In general these bodies adopt a rather conservative, non-permissive, approach to research with little recognition that lack of information may cause suffering or cost lives. In the case of the OIC and GMC, medical research is not a major area of expertise. PIAG was set up under the Health and Social Care Act 2001 specifically to advise on research using identifiable data. We received evidence that PIAG has helped in some ways – for instance in giving class support to cancer registration whose very existence was undermined by an astonishing directive by the GMC in 2000. However, PIAG's processes are cumbersome. A simplified, efficient scheme of research assessment is now urgently needed.

Researchers must understand that public concerns about confidentiality and the use of personal data are increasing for many reasons. They cannot rest their case on the truth that, until now, there has been much benefit and no harm, and that all that is required is continued public trust in the confidentiality of research dedicated to the public good – essential though this is. Trust must nowadays be engendered and maintained by demonstrably excellent standards of data security, ethical review, staff training and requirements for consent and anonymisation. The Academy therefore recommends the development of good practice guidance in these areas and looks to the UK Clinical Research Collaboration to take this forward.

Early in its enquiry the Working Party realised that interpretation of, and concern for, public opinion and expectations lay behind the legal, regulatory and administrative difficulties. We were struck by the poor quality of most research into public attitudes. There are only a handful of studies where informed questions are asked of a large, representative population. We therefore recommended that medical research funders should support research in this area – an initiative already started by the Wellcome Trust and Cancer Research UK.

We not only need to know more but there must be better dialogue between researchers, research funders, the DH and the public on this topic. The research mission of the NHS is seldom mentioned in literature given to patients – in striking contrast to its role in teaching nurses, medical students and other staff. Consent for research within the NHS cannot be assumed if it is not mentioned as a legitimate aim. In the development of the electronic care records the DH understandably does not want the primacy of confidentiality to be undermined in gaining public acceptance. However, in our discussions with patient representatives there was strong support for research using health data. There was great concern that a vocal minority, loudly proclaiming the right of privacy, might override the unexpressed desire of many people to contribute to the public good. The Academy therefore recommends that a long-term programme of public engagement concerning research uses be established. The benefit for health will strengthen the perceived value of the electronic care record in the opinion of the public.

These recommendations will, if pursued energetically, start to reverse the damage that has been done in recent years and give the UK the chance to be, once again, the front runner in the field of research in population health.

The Academy of Medical Sciences, established in 1998, promotes advances in medical science and campaigns to ensure these are converted as quickly as possible into healthcare benefits for society. The Academy Fellowship is made up of over 800 leading medical scientists from hospitals, academia, industry and the public service and gives the Academy the expertise and authority to deal with public policy issues in healthcare in their wide scientific and societal context. The President is Sir Keith Peters, FRS PMedSci. Further information about the Academy can be found on the website: www.acmedsci.ac.uk

Science & Innovation in Germany: The New Federal Government's Research Policy Agenda

Ursula Roos,
Science & Innovation Officer, British Embassy Berlin

Germany's Gross Domestic Expenditure on R&D was €54.3bn (£37.4bn) in 2003 (latest figure available) or 2.55% of GDP. Industry accounted for 68.9% or €37.4bn (£25.8bn) of this. Public-sector research is done both at universities and at Germany's non-university research institutes (Max Planck, Fraunhofer, Helmholtz and Leibniz). Germany's engineering base remains strong, but its efforts to catch up in biomedical research are often hampered by debate about the risks and ethical boundaries of such research.

The Research Policy Agenda of Germany's new Federal Government

Last September's federal elections resulted in the formation of a coalition Government between the Social Democrats and the Christian Democrats. The new Government set out key elements of its science and innovation policy agenda in the 12 November coalition agreement:

- Increasing Gross Domestic Expenditure on R&D: The federal Government is committed to increasing Germany's expenditure on R&D to 3% of GDP by 2010. Public-sector R&D spending will increase by €6bn (£4.1bn) by 2009. This will have to be matched by industry.
- Supporting the Lisbon Strategy: Germany's EU Presidency in the first half of 2007 will support the Lisbon Strategy. Presidency objectives include the launch of new programmes in education and research, further development of ERA, and co-operation with international partners outside the EU.
- Development of a new Internationalisation Strategy for R&D: This seeks to increase both the level of networking and the degree of co-operation from individual scientific exchange to joint research laboratories.
- Concentrating R&D funding on sectoral priorities: The Government will promote priority areas, including nanotechnology, energy, and health. There will be a boost for clinical research, including a register for public-sector clinical research projects. Germany will promote research on human adult stem cells. Greater emphasis will be placed on security research.
- Support for innovative companies: Germany's Government will continue schemes to promote innovative companies. This includes the €260m (£180m) High-Tech Startup Fund and the joint Federal Government/European Investment Fund facility to promote access to venture capital in high-tech sectors.
- Knowledge transfer and clusters: Germany is developing a programme to accelerate knowledge transfer between academia and industry within the framework of collaborative clusters. The Government will promote innovative clusters in Germany's 16 Federal states (Länder) in order to increase productivity and growth. It will also develop a High Tech Strategy to promote leading edge technologies. This will cover IPR and standards, and better use of Government procurement to promote innovation.
- Promoting scientific excellence and introducing full economic cost funding of research: The new federal Government is committed to providing its 90% share of a €1.9billion (£1.3bn) Federal and Länder initiative to promote excellence in university teaching and research. Grants provided under this Excellence Initiative will include an additional 20% to cover full economic costs. The German Research Foundation (DFG), equivalent to the UK's funding Research Councils, is planning to put its funding schemes on a full economic cost basis.

Scope for Bilateral UK-German Co-operation

The scope for bilateral collaboration is wide. It includes the exchange of best practice. Germany, for instance, is keen to learn from the UK's experience in areas such as research assessment, R&D tax credits and full economic cost funding. The UK's system of scientific advice to policy, which Sir David King presented in Berlin on 12 January 2006, has met with considerable interest. Germany has no equivalent to a Chief Scientific Adviser, nor does it have a single national academy of science.

Britain and Germany are close on and thus key drivers of a number of European research policy issues. And there are collaborative opportunities in specific scientific disciplines. There are close links in climate change, following the Berlin State Visit Climate Change Conference in November 2004. Large international research projects (eg the X-FEL laser facility in Hamburg) or European projects (eg in microsystems engineering) also offer opportunities for collaboration.

Looking ahead

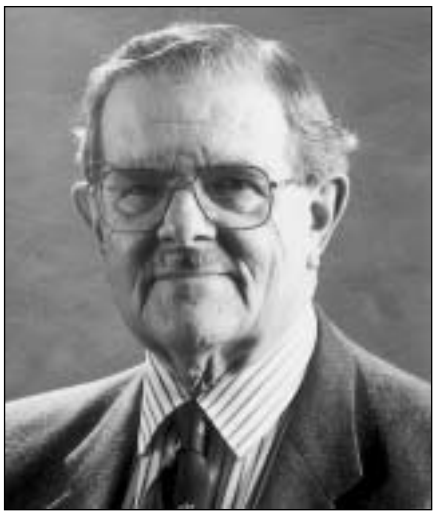
Looking ahead, the Science & Innovation Team in Germany is working with partners on a number of projects to promote UK-German science collaboration during 2006. Forthcoming events include a conference on Trust in Science co-organised with the Schering Foundation. UK Trade & Investment (UKTI) in Germany plan to promote excellence in British science to German companies and to encourage R&D collaborations. Two major bilateral conferences in Berlin, on climate change research and energy respectively, will offer excellent opportunities to showcase the UK.

For information about activities by the FCO's Science & Innovation Team in Germany see: http://www.britishembassy.de/S&I

MEETING OF THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE ON MONDAY 17TH OCTOBER 2005

Some 40 per cent of GPs recommend CAM therapies to their patients – indeed, 20 per cent offer them on their premises. Although many doctors accept that CAM has much to offer their patients, others are not so sympathetic. Nevertheless CAM is increasing in popularity with many patients who claim to have benefited. Is the evidence base for the efficacy of any of the twenty-five recognised CAM therapies good enough to justify the taxpayer paying for this treatment as part of the NHS?

Complementary and Alternative Medicine – should it be provided on the NHS?



Lord Walton of Detchant

For ten years I served as a Member of the House of Lords Select Committee on Science and Technology, and chaired three Sub-Committee Enquiries, producing Reports which were accepted by the parent Committee and eventually debated in the House. The last enquiry which I chaired was into Complementary and Alternative Medicine (CAM). To assist the enquiry, two specialist advisors were nominated, namely Professor Stephen Holgate, who will speak later, and Professor Simon Mills, Director of the Centre for Complementary Health Studies at the University of Exeter.

Our first task was to try to achieve a definition of terms. We concluded that alternative medicine normally refers to a number of professions or disciplines which claim to offer systems of diagnosis, prognosis or management using approaches different from those employed in conventional Western medicine.

Complementary medicine we accepted as embracing a number of other professions or disciplines which do not usually offer diagnostic information, but which are more often used to complement the treatment offered by conventional medical practitioners. We broadly accepted the definition provided by the Cochrane Collaboration as "A broad domain of healing resources that encompasses all health systems, modalities and practices and their accompanying theories and beliefs, other than those intrinsic to the politically dominant health systems of a particular society or culture in a given historical period."

Having issued a public call for evidence, we received 185 written submissions, and held 21 oral hearings, interviewing 44 representatives of many organisations in the conventional medical field, in science and in CAM. Several individuals also gave oral evidence. One witness was Dr Stephen Straus, Director of the Office of Complementary and Alternative Medicine in the USA, an organisation funded by the National Institutes of Health in order to undertake research in CAM. In our enquiry we were not primarily concerned with efficacy, but were required to consider evidence, regulation, training and education, research and development, information availability and the delivery of CAM, including the question as to whether it should be provided by the NHS.

It soon became clear that the uptake of CAM in the UK had increased steadily. More than 15% of people in the UK had consulted CAM practitioners and more than 30% had bought over-the-counter remedies used in CAM, with a total annual expenditure approximating to £1.6 billion. In the USA expenditure was estimated at some US$27 billion.

Eventually, we classified the CAM professions and disciplines into three groups. In the first group were those known as "the big five", namely osteopathy, chiropractic, herbal medicine, acupuncture and homeopathy. The professions of osteopathy and chiropractic are individually regulated by Acts of Parlament. Herbal practitioners in the UK are also to some extent a cohesive group, who have developed a powerful method of voluntary self-regulation and who subscribe to scientific principles. Very many powerful drugs in common used in Western medicine are of herbal origin. We also learned that, through the British Acupuncture Registration Board, practitioners using acupuncture,

some of whom are doctors and nurses but many of whom hold no other professional qualification, had begun to develop a mechanism of self-regulation. There is good physiological evidence to show that acupuncture can induce an increased output of endorphins (the body's own analgesics) from the central nervous system. We also included homeopathy, a long-established method of diagnosis and treatment used in the UK by many medical practitioners, but also by non-medical homeopaths, in Category 1.

In our Category 2 we included disciplines such as aromatherapy, massage, counselling, reflexology, shiatsu, hypnotherapy, meditation and different varieties of healing. We found that these disciplines were complementary in being used, generally, but not invariably, to complement conventional medical treatment.

Category 3 gave us the greatest difficulty. In Category 3a we included ancient Chinese medicine and Ayurvedic medicine; we were concerned by some principles employed in Chinese acupuncture and Chinese herbal medicine, not least because the large combinations of herbs, widely used in both ancient Chinese medicine and, to a lesser extent, in Ayurvedic medicine, have sometimes included harmful components such as aristolochia, which can cause serious renal damage, while some preparations also contain combinations of heavy metals which may be deleterious. We also feel that many of the concepts upon which these disciplines rely (the elements, ying and yang and the five doshas, for example) which date from antiquity, are totally outdated. We therefore classified them in Category 3a, implying that, when practised according to traditional concepts, they seemed to us to lack validity. Nevertheless, we discovered later that some practitioners of ancient Chinese medicine and many of Ayurvedic Medicine take part in scientifically valid research, exploring the value of individual herbal preparations as distinct from massive combinations. In Category 3b we classified several disciplines for which we could find no credible supportive evidence, including crystal therapy, radionics, dousing and kinesiology.

While much evidence we received stressed, very properly, the role of the therapist and of the placebo response, which has been shown, in conventional medicine, to have profound effects upon many bodily organs and especially upon the body's immune system, we did receive evidence to indicate that several of the CAM disciplines, especially those in our group 1, do have specific effects which could not be wholly accounted for by the placebo response. We also noted that many alternative and complementary practitioners were able to offer much more time for consultations than can busy doctors. The Cochrane Collaboration reviewed 154 trials, 40% of which revealed some benefit. The recent Smallwood Report felt that CAM in the NHS would be cost-effective, a point disputed by Ernst and his colleagues in a recent paper in the British Medical Journal.

Accepting that the practice of osteopathy and chiropractic is controlled by Acts of Parlament, we recommended that herbal medicine and acupuncture should seek for statutory regulation under the Health Act 1999, alongside other healthcare professions; we took the view that this might become possible for homeopathy, once differences of opinions and practice, as between medically qualified homeopaths and those without medical qualifications, are resolved. We also recommended that the many organisations representing the disciplines in Category 2 should seek to develop a system of rigorous voluntary self-regulation for each , with a view perhaps ultimately to becoming registered by Statute.

In relation to education and training, we recommended that each profession should define a core curriculum including elements of anatomy, physiology and clinical medicine, as well as statistics and the accumulation and analysis of evidence. We felt it imporrtant that conventional medical practitioners, nurses and others working in the healthcare field should develop some understanding of the CAM disciplnies so as to be aware of the principles underlying the systems which many of their patients may consult. We also recommended simple familiarisation courses for undergraduate medical students.

We also discussed the crucial importance of randomised controlled trials, sequential trials and many other research techniques designed to collect evidence on the validity and efficacy of the various CAM disciplines, with particular reference to being able to demonstrate which had effects superior to placebo. We also recommended the establishment of Centres of Excellence in UK universities, where CAM practitioners could undertake research programmes in collaboration with scientists, doctors and others already well versed in research techniques. We were pleased to note that the NHS R&D organisation has now supported several such research projects in the CAM field. We also considered mechanisms by which high quality information about CAM could be made available, not only to the public, but also to healthcare professionals, and recommended that NHS Direct might be a useful source of information. We also recommended that health authorities should work with representatives of the well-regulated CAM professions to produce information about well-qualified CAM practitioners in their respective areas and regions.

Finally, in relation to the provision of CAM in the NHS, we recommended that primary care groups and trusts should be willing, in appropriate circumstances, to fund consultations and treatment using well-established, well-regulated and well-founded CAM methods, but that all such consultations paid for by public funds (ie through the NHS) should be by referral from doctors or other healthcare professionals, working in primary, secondary or tertiary care. Our Report was accepted without significant modification by the parent Committee, and was debated in the House of Lords early in 2001. Our recommendations were accepted, virtually entirely, by the Government. I and all those who served on the enquiry look forward to seeing whether, how and when our recommendations will be implemented.

Integrated Health Care; What can be learned from Complementary and Alternative Medicine

Professor Stephen Holgate, Medical Research Council Clinical Professor of Immunopharmacology, University of Southampton

The House of Lords report on complementary and alternative medicine (CAM) published in 2002 has led to the wider recognition of complementary approaches for the delivery of health care with improvements both in regulation and in research. However, the recent Smallwood Report "The Role of Complementary and Alternative Medicine in the NHS" and recent articles in the premier medical journals have once again brought this field of medicine to the forefront. It is, therefore, worth exploring some of the issues that fuel this debate.

Features of Conventional Medicine and CAM

Practitioners of CAM often say that they do things differently and have a special connection with the patient (or client). The Parliamentary Select Committee on Science and Technology that reported on complementary and alternative medicine in 2002 stated *"any therapy that makes specific claims for being able to treat specific conditions should have evidence of being able to do this above and beyond the placebo effect"*. However, in a recent editorial in the Lancet[1], Vandenbroucke commenting on continued controversy over the use of homeopathy and the growth of truth quoted William Osler in his Harvean Oration of 1906 *"Truth may suffer all the hazards incident to generation and gestation….. all scientific truth is conditioned by the state of knowledge at the time of its announcement"*. There are clearly some fundamental differences in the way that orthodox and complementary medicine deliver their practice. Orthodox medicine is focused on specific disease causation, is divided into specialties and delivers treatment specific to the diseased organ(s) (one disease, one target, one cure). In contrast, CAM addresses distributed cause, is not divided into specialties and treats the whole person with multiple therapies that are not necessarily disease-dependant.

It is increasingly recognised that there are some problems which currently afflict conventional medical practice. These include the management of chronic disease and pain and unexplained symptoms eg chronic fatigue syndrome; being able to take full account of changing behaviour eg housing, diet, stress and life style; patients sense of fragmentation, disempowerment and dehumanisation; concerns about drug side effects and the cost of adverse events and a lack of time for communication between patients and health care professionals. Thus a legitimate question to be asked is whether CAM represents a signpost for modern medicine's missing elements.

The Prince of Wales' Foundation for Integrated Health defines integrated healthcare as incorporating integrated medicine as its core component, but is a broader concept that goes beyond the treatment of illness to emphasise the importance of improving health and wellbeing, views the living person as more than a collection of molecules, cells and organs which may or may not be working properly and sees the human as an integrated self-correcting whole. Thus it views good health not simply as the absence of illness, but as a self regulating state that involves interacting complex systems. Professor Michael Hyland, a psychologist from the University of Plymouth, views health as a complex system in which parts form wholes, with everything being interconnected and the whole behaviour not being predictable from the behaviour of the individual parts[2]. As a consequence new properties of the component parts and the whole system emerge. He states that changing a part will lead to a change in the whole and that changing the whole will lead to the part changing. Based on this health concept represents the behaviour of the whole system which has the capacity to self- organise and adapt to constant change. Integrated health care is directed towards supporting this adaptation. Hyland emphasises the important of networks with the brain at the centre of a self-regulating, self-organising pattern recognition system that is intimately connected to immune and endocrine systems functions. Two types of error in this complex system may lead to human disease. The first is an organic error leading to abnormalities in sequential processing involving molecules, cells and organs and against which conventional treatments operate. The second is to an information error which is more closely linked with alterations in lifestyle and involves network processing and an imbalance against which CAM is directed.

The Role of Specific and Non-Specific Treatment Effects

It is stated by some that the placebo or dummy treatment effect underlies much of the therapeutic benefit that patients experience with medical intervention and that this non-specific (incidental or placebo) effect differentiates CAM from orthodox medicine. In conventional randomised placebo controlled trials (RCT) designed to investigate a specific therapeutic intervention, the placebo effect is also often large and not infrequently exceeds 50% of the total treatment response eg analgesia and depression. In RCTs the placebo is subtracted to isolate the specific therapeutic response of the actual intervention (efficacy). Thus, the components of therapeutic response comprise the sum of the specific effect (efficacy) and the non-specific effect (placebo). In the "real world" the therapeutic response (or effectiveness) of a treatment equals the sum of efficacy and placebo. With different forms of therapy the relative contributions of the specific and non-specific responses will differ. In seeking to characterise the incidental or placebo effects in complex interventions used in CAM such as acupuncture Patterson and Dieppe[3] made the following four points:

1. The RCT developed to test new drugs is based on bio-medical assumptions alone.
2. In a drug trial talking and listening to patients are often defined as incidental (placebo) factors separate from the drug effect.
3. In CAM interventions the characteristic and incidental factors are intertwined.
4. Use of placebo or sham controlled trial designs for complex interventions may lead to false negative results.

This publication led to an extensive debate in the British Medical Journal correspondence column with a wide range of views being expressed about the relative importance of non-specific responses with different types of treatment. Possible factors that make up the placebo effect include improved adherence to concomitant treatments, Pavlovian conditioning, expectation and a physical (or "organic") response. Use of functional brain imaging such as PET, MRI and SRI has now demonstrated that placebos can indeed mimic drugs in activating the same brain areas as some specific treatments eg in Parkinson's disease, pain relief, depression and the use of stimulants[4]. These findings greatly enrich the debate regarding the relative benefits of specific and non-specific treatment responses.

It is now known that sustained pain results in the release of endogenous opioides that stimulate opioide mu receptors in cortical and subcortical regions of the brain, and that activation of these receptors reduces sensory and affective ratings of the pain experience[5]. By applying functional magnetic resonance imaging (fMRI) of the brain, placebo analgesia decreases activation in the pain sensitive regions – the thalamus, insula and anterior cingulate cortex. The placebo also increases fMRI activity in the prefrontal cortex during anticipation of pain. Of great interest was the finding that both placebo induced analgesia and altered perception of pain were effectively blocked by naloxone an opioid receptor antagonist.

Implications for CAM

The recent study investigating the effect of acupuncture on pain in osteoarthritis has revealed 12% specific effect versus a more than 30% placebo effect. Based on findings described above expectancy and belief could modulate the therapeutic response of pain relief by acupuncture. In a trial of patients with osteoarthritis, Pariente et al[6] undertook PET scans of the brain (that reflect local blood flow) before and after "real" acupuncture, Steitberger needle placebo and sham placebo (skin prick distant from the acupuncture point). They demonstrated that the various treatments each gave increased brain PET signals in the right prefrontal cortex, anterior singular cortex and thalamus the treatment order effect being real acupuncture > Steitberger placebo >> sham placebo. These findings reinforce the view that real acupuncture has both a specific effect on the pain centres in the brain but also a non-specific effect also via the brain's reward system. Thus, at least in the case of pain relief, active treatment and different types of placebo may have effects on the brain that may truly complement each other. This might indicate that every effort should be made to enhance the non-specific effects of a treatment eg by practitioner interaction and the health care setting and, by doing so, this can add to or enhance the effect of a specific treatment. The fact that CAM is conducted in a way that maximises the non-specific response may help account for a substantial portion of the treatment effect beyond any specific action, and that in conventional medicine insufficient attention is given to this aspect of health care in focusing only on unitary solutions in the form of drugs or surgery.

The challenge of integrated health care

Recognising that the human organism is a complex system, it is apparent that each level of the system speaks a "different language" and yet communicates continually, the levels being entangled and self organising[2]. Integrated health care that interacts with this complex system entails more than simply combining conventional with complementary approaches. It emphasises health promotion, self-care and patient practitioner partnership. It aims to trigger, support or remove constraints on the ability of the mind and body to heal itself and it sees the humanisation of health care as a central issue. There is already ample evidence that when doctors use communication skills effectively, their patients and they benefit. Integrated health care means not using reductionist approaches alone, but being aware and understanding the importance of body intelligence and the impact of the lived experience, triggering adaptation and self healing processes, tailoring treatment to individual needs and circumstances, optimising the human factor, encouraging participation and empowerment. Thus, such whole person care requires practitioners who utilise both the science and the art of medicine.

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Integrated Healthcare for better Health and Happiness

David Tredinnick MP

I am honoured to address this audience and follow on after two such illustrious speakers and with all the Doctors in the House of Commons present. I have been involved with Complementary Medicine for 30 years. I fell off a horse in 1976 and then had to turn to Chiropractors and Osteopaths to help straighten out my spine. Subsequently my wife had allergies and headaches, resulting in visits to Jean Munro in Hemel Hempstead for treatment and she has never had a headache since. Homeopathy has helped my family with treatment for asthma, colds, and I have had crippling pain that has been successfully treated using acupuncture, that is the one component of Chinese Medicine listed in the first category in the House of Lords report. Our group, the All-Party Parliamentary Group for Integrated and Complementary Healthcare has two objectives:

1) to bring Complementary practitioners together and

2) briefing Members of Parliament on the benefits of Complementary Medicine.

When the Government changed from Conservative to Labour I changed strategy and have taken every opportunity to question the Health Minister on Complementary Medicine at every single Health Questions in order to get the matter up in lights. According to Tony Benn, "first they say you are mad, then they agree with you, then they want to own the idea." This resulted in me being dubbed "the Member for Holland and Barrett". Ironically their headquarters are in my constituency.

This talk focuses on the past, present and future for Complementary Medicine. There has been an exponential growth in demand for Complementary Medicine to the extent that half of the population have now had some experience of it. People are not fools and tend to buy things that work. The first major attempt to improve CAM acceptance and regulation was in the 1987 Parliament. In the 1992 Parliament the two Private Members Bills on Osteopaths and Chiropractors both became law, bringing them into mainstream medicine with the establishment of regulatory bodies. The next stage was the House of Lords report in 2002 with definable categories. I would disagree with some of the categories, but overall it was a brilliant piece of work that gave us a benchmark to work around. There are some out there that say that some of the categories are wrong. I don't see personally that you can claim that Chinese Medicine that has been around for 2,000 years should be divided into two different categories. With 60,000 hospitals in China delivering Chinese Medicine perhaps these methods delivered over 2,000 years have some credibility? On some of the zanier treatments, ignoring Crystal Therapy which we are not going to discuss further this evening, I would say that 20 years ago, what is now seen as mainstream Complementary Medicine was then seen as wacky and off-the-wall. I put it to this distinguished Committee that they should bear in mind that things do change and that it is possible that some of these treatments that have not been given much credibility may in the end turn out to be quite helpful.

Where are we now in the political world? There have been some very important developments; first of all the Government has brought in practice-based permission for healthcare which means that doctors now have almost got their GP Fundholders status back that the Conservatives brought in. It

is giving them more purchasing power and the ability to choose where and what services they buy. I understand that 50 per cent of GP practices are now using Complementary Therapy to some extent and that there will be a huge increase in demand through these practices.

The second interesting development will be the third major change, namely Stephen Smallwood's report which is very helpful as it identifies the so-called effectiveness gap in the health service where there is not enough treatment available. In the past the Complementary Therapies were given the really hopeless patients that doctors call privately the "heart-sink patients". They are the ones that were farmed out to the Complementary Therapists. Amazingly, about 75% of heart-sink patients get relief in the Complementary Medical sector.

Now we have these clearly identified effectiveness gaps which is jargon for saying that there is not enough treatment around for back pain, knees or stress and nausea. What is now needed is for these to be linked up with Complementary Therapies and the recommendation that the National Institute for Clinical Excellence (NICE) performs further studies on this is welcomed. But what has not been picked up from the Smallwood report is that it also stated that Complementary Medicine is more effective than Mainstream Medicine.

So what about the future? Are Complementary Medicine and Integrated Healthcare here to stay? The whole thrust is towards better regulation, awareness and knowledge.

Regulation of acupuncture and herbal medicine is now almost complete. There are many clinics nationwide with useful research studies, such as the Glastonbury Clinic the Get Well UK Clinic in Camden that offers advice to doctors by helping them to find suitable Complementary Practitioners.

I would like to finish by emphasising that the risks of Complementary Medicine are overemphasised, especially since there are many cases in Mainstream Medicine where the use of drugs such as aspirin can cause death, and even travelling around by London transport is not risk-free.

There are 50,000 Complementary Therapists and huge gaps in our National Health Service. Let us have better regulation and interfaces with our doctors. This is a hugely exciting time and if we go down the route of Integrated Healthcare we will have a healthier and happier population.

In discussion the following points were made:

Variations in genotype affect the sensitivity and responses to both the placebo and to conventional and integrated medical therapies and the whole genome should be considered when treating chronic fatigue syndrome. Medical approaches to disorders of the prostate in the UK differs from those in the EU where herbal medicines are the treatment of choice and which have also been successfully used to extend longevity. The increase in conventional medical treatments has also grown enormously starting from a very restricted base in the early days. Intercomparisons between integrated and conventional medicine therefore should be continually updated. Integrated medicine emphasises the importance of the individual, in preference to the general application of a more conventional medical system. Delivery of the latter may be unduly constrained by a single, undifferentiated approach to population studies, based on systematic drug treatment hierarchies, with pressure on doctors to conform and subject to legal issues, with hospitals where pharmacists apply drug regimes based on external criteria, and doctors who don't know their patients. For example, pooling the results of research on asthma studies on 3 year olds with those of young adults is anti-science and provides unusable data. An open mind is needed, based on direct observation, resulting in various differing explanations.

The culture base for Chinese medicine is 2,000 years old which accounts for some of the differences from a more reductionist conventional medicine that tends to consider human health issues in isolation from one another. Nevertheless evidence is still needed for proper regulation of integrated medicine, to help inform sceptical doctors and to assess the science base for diagnostic procedures, using the pulse and tongue and therapies such as acupuncture for example. The human body needs to be put back together and considered holistically. Many modern treatments are based on ancient herbal remedies. For example, Indian scientists have recently provided scientific interpretations that support traditional Ayurvedic medicine that can also benefit from both placebo and and cultural effects. GPs can currently only afford 10 minutes per patient. How can this be extended to 45 minutes to match that of integrated therapists? The main benefits of medical research in the last 50 years have arisen from randomised, controlled trials and the production of high quality efficaceous medicines. In summary, don't subtract the placebo effect as it may be one of the benefits of integrated medicine, for example, thought alone may provoke change. Whole person medicine giving help and comfort to the patient should be provided by the NHS.

FROM THE GREEN TO THE GENE REVOLUTION – A 21ST CENTURY CHALLENGE

MEETING OF THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE ON WEDNESDAY 26TH OCTOBER 2005

Dr Borlaug – who is credited with saving more lives than any other person who ever lived – joined the Rockefeller Foundation's pioneering technical assistance programme in Mexico in 1944 where, as a geneticist and plant pathologist, he directed the Cooperative Wheat Research and Production Program. Within twenty years he was spectacularly successful in finding a high yielding short-strawed, disease resistant wheat. He arranged as a practical humanitarian to put the new cereal strains into extensive production to feed the hungry of the world thus providing in his words "a temporary success in man's war against hunger and deprivation", a breathing space in which to deal with the "Population Monster" and the subsequent environmental and social ills that too often lead to conflict between men and nations. Vast acreages of the new wheat were planted with revolutionary yields harvested in Mexico, India and Pakistan – the Green Revolution, which led to the award of the Nobel Peace Prize in 1970.

Since 1986, he has been the President of the Sasakawa Africa Association, and leader of the Sasakawa-Global 2000 agricultural programme in sub-Saharan Africa, along with former US President Jimmy Carter, which has worked with several million farmers in 15 countries of sub-Saharan Africa to increase food production.

From the Green to the Gene Revolution – A 21st Century Challenge

Norman E Borlaug

My career in international agriculture began in 1944, when I joined the recently established Rockefeller Foundation agricultural program in Mexico, the first systematic attempt to reduce a food deficit and increase food production. The Rockefeller-Mexican agricultural program was the forerunner – and in many respects the model – for the network of 15 international agricultural research centers that emerged two decades later, and which today are funded through the Consultative Group for International Agricultural Research (CGIAR), of which the United Kingdom is an active member.

The first two centers – the International Rice Research Institute (IRRI) in the Philippines established in 1960 and the International Maize and Wheat Improvement Center (CIMMYT) in Mexico, first established in 1963 and lately reorganized in 1966 – became the international agricultural research and development leaders in Asia, whose varieties and crop management information launched the so-called "Green Revolution."

Between 1965 and 2000, the area in developing Asian countries planted with new high-yielding wheat and rice varieties increased from zero to 170 million ha. The new seeds were the catalyst for a doubling in irrigated area, a 35-fold increase in fertilizer use, and a 20-fold increase in the use of agricultural machinery, and more than a three-fold increase in cereal production – from 309 to 962 million tonnes. Without these gains, what would have happened to the Asian population, which grew from 1.6 to 3.5 billion people over this period?

Science and technology has had its greatest impact on the lands best suited to agriculture. Over the past 50 years, the world's farmers have been able to triple world cereal production – from 650 million metric tons to 1,900 million with only a 10 per cent increase in total cultivated cereal area. If we had tried to produce the world cereal harvest of 2000 using the agricultural technology of 1950, we would have needed an additional 1.1 billion hectares of land, of the same quality, over and above the 660 million hectares that were actually used. Too often, the environmental critics of modern agriculture fail to see these very beneficial aspects to producing more food, feed and fiber on the lands best suited for these uses, so that other lands can be spared for other uses.

Despite the successes of the Green Revolution, the battle to ensure food security for hundreds of millions of miserably poor people is far from won. Mushrooming populations, changing demographics, failed rural development programs, including those designed to take farmers off the land into other jobs, and environmental abuses have all taken their toll. Enormous challenges lie ahead to ensure that the projected world population in 2025 of around 8 billion people is adequately and equitably fed, and in environmentally sustainable ways.

Over the next 20 years, world cereal demand will likely increase by 50 per cent, driven strongly by rapidly growing animal feed use and meat consumption. With the exception of acid-soil areas in South America and Africa, the potential for expanding the global land area is limited. Future expansions in food production must come largely from land already in use. The productivity of these agricultural lands must be sustained and improved. Central to achieving these productivity gains will be a "Blue Revolution," one in which water-use productivity is much more closely wedded to land-use productivity. Significant improvements in water-use efficiency can be achieved through conservation tillage, planting on beds, and drip irrigation.

Roughly 50 per cent of the world's 800 million hungry people live in marginal

lands and depend upon agriculture for their livelihoods. These food-insecure households face frequent droughts, degraded lands, remoteness from markets, and poor market institutions. Investments in science, infrastructure and resource conservation are needed to increase productivity and lower their production risks. Some of the problems farmers in marginal lands face will be too formidable for science to overcome. However, significant improvements should be possible. Moreover, biotechnology can play a major role, through developing new crop varieties with greater tolerance to pests and diseases, drought, and with higher nutritional content.

Africa is the biggest food security challenge we face, although there is still too much hunger in Asia and among indigenous people in Latin America. A twin-track anti-hunger strategy is needed – first, a productivity-led agricultural growth component and second, safety net programs to assist the chronically hungry.

Why hasn't a Green Revolution taken off in Africa? I don't think the reason is one of technology, although Asia certainly had more of its farmlands under irrigation. I think the principal difference between Asia and sub-Saharan Africa is the infrastructure. One World Bank estimate predicts that it might take another 20 years for Africa to reach the road density that India had in 1960. This is unacceptable. Adequate transport is central to commercial agriculture and rural development. Roads also bring indirect benefits – schools, clinics, transport, and improved communications between different ethnic groups. They are a tremendous catalyst for positive change.

Since 1986 I have been engaged in a small agricultural development project in Africa, financed by the Nippon Foundation of Japan. Former US President Jimmy Carter is part of this effort. Several million demonstration plots – mostly maize – have been grown by smallholder farmers, employing a relatively simple package of recommended technology. Average yields have been two-to-three times higher than national averages. But without roads, the cost of bringing in fertilizer is 3-4 times higher than what farmers in other regions pay. Thus, African farmers are unable to apply even modest amounts of fertilizer to their crops, less than 10 per cent of the world average.

I am especially proud of our promotion of quality protein maize (QPM), with much higher levels of the amino acids lysine and tryptophan, which measurably improve nutrition for humans and monogastric animals in maize-dependent diets. CIMMYT scientists were instrumental in developing QPM as a viable crop. African researchers in 10 countries have selected QPM varieties which are grown by farmers on upward of 400,000 ha.

Over the last 20 years, biotechnology based upon recombinant DNA has developed invaluable new scientific methodologies and products for food and agriculture. Recombinant DNA methods have enabled breeders to select and transfer single genes, not only reducing the time needed in conventional breeding to eliminate undesirable genes but also allowing breeders access to useful genes from other distant species. So far, agricultural biotechnology has mainly conferred producer-oriented benefits, such as resistance to pests, diseases, and herbicides. But many consumer-oriented benefits, such as improved nutritional and other health-related characteristics, are likely to be realized over the next 10 to 20 years.

Despite formidable opposition in certain circles to transgenic crops, commercial adoption by farmers of the new varieties has been one of the most rapid cases of technology diffusion in the history of agriculture. Between 1996 and 2004, the area planted commercially to transgenic crops has increased from 1.7 to 81 million ha, and will likely surpass 100 million ha in 2005. Herbicide resistance is revolutionizing soybean production. The use of genes from a soil bacterium, *bacillus thuringiensis*, or Bt, confers excellent resistance to several classes of damaging insects in maize, soybeans and cotton.

The Bt cotton story is especially impressive. Some nine million hectares and six million small-scale farmers in China, South Africa, and India are growing Bt cotton, greatly improving their yields and profitability, and significantly reducing their use of insecticides.

Today, the world's wheat farmers face a dangerous situation. For the last 53 years we've had no major change in stem rust organism any place in the world. But in 1999, first reported in Uganda, then in Kenya and now in Ethiopia, a new race of stem rust has evolved that is capable of severely damaging perhaps half of the world's bread wheat.

The publicly funded international disease screening and testing system we had 25 years ago has broken down, partly a victim of the malaise that has led to steady declines in real public sector research funding. We had better wake up before it's too late.

Despite the formidable challenges to meeting the Millennium Development Goals, look at where the world's governments spend too much of their money – US$ 900 billion annually on armament and military.

We still have close to 900 million adults who are illiterate – and nearly twice as many women illiterate as men – and 150 million primary school-age children still not in school. This is appalling in this day and age.

Lest we forget, as the late Lord John Boyd Orr, the first director general of FAO so aptly said, "You can't build peace on empty stomachs," to which I add, "or human misery."

In discussion the following points were made:

The grossly exaggerated fear of genetically modified food has seriously delayed its introduction to the UK and Europe. Bird flu has had no impact on people in the UK yet, and may never do so. The public tend to respond negatively to science-driven change while still acknowledging that science and technology are important. The British press have described GMOs as "Frankenstein Food" and this may reflect the fact that our more senior scientists are not speaking in public in defence of science and technology. In spite of these apparent problems human longevity is still increasing. What message should be prepared to indicate to the public, for the future benefit of mankind, that all GMO food is safe to eat provided ethical issues are addressed? For example, what possibility is there for the technology transfer of sugar cane to sub-Saharan Africa in support of a new bioethanol industry? The gene for common sense appears to be missing among the decision makers. Pakistan became self sufficient in 7 years in wheat and rice and India in 10 years, arising directly from the importation of modified crops. In spite of this success Swaminathan was attacked without any justification. There is an urgent need for people who know how to integrate all relevant techniques and how to work together across disciplines with support from political leaders, leading to commercial production.

RISK MANAGEMENT – SHOULD THE PRECAUTIONARY PRINCIPLE BE REPLACED BY RISK-RELATED ANALYSIS FOR INDIVIDUAL NEW TECHNOLOGIES?

MEETING OF THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE ON MONDAY 14TH NOVEMBER 2005

Disputes and uncertainties are an essential part of the concept of science and are not an indication of disagreements between individuals. Should we therefore improve our ideas and models by testing them to destruction, or are some so potentially dangerous and possibly irreversible in their consequences that we dare not take any action for fear of the unknown? Would it be possible to replace the Precautionary Principle with an analysis of the risks associated with individual new technologies?

Risk and Precaution: changing perspectives from the Royal Commission on Environmental Pollution

Susan Owens
Professor of Environment and Policy, University of Cambridge
Royal Commission on Environmental Pollution

Principle 15 of the Rio Declaration neatly encapsulates the key elements of the precautionary principle:

"Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation".

Application of this principle – increasingly influential in environmental policy since the 1970s – is typically associated with taking pre-emptive action rather than waiting for proof of harm, with less reliance on the capacity of the natural environment to assimilate and neutralise pollution, and with greater emphasis on reducing potential problems at source using the "best technology not entailing excessive costs".

Since 1970, when it was created by Harold Wilson in response to mounting environmental concern, the Royal Commission on Environmental Pollution (RCEP) has been influenced by and has itself influenced a broader trend towards precaution in environmental affairs. In its early days, the precautionary principle was regarded with suspicion in the UK as a "contintental" philosophy, alien to the British ("dilute and disperse") approach to pollution. Demands for tighter control typically met with a robust response: "you haven't proved that there's a problem, the science is uncertain, it's too expensive and would damage business".

In this climate, the Royal Commission's position – best characterised as one of "cautious precaution" – was quite radical. One of its best known earlier recommendations – that there should be no significant commitment to civil nuclear power until the possibility of dealing safely with nuclear waste had been demonstrated – was essentially precautionary (RCEP 1976). The argument in its ninth report (RCEP 1983) that lead additives should be phased out of petrol was classically so, grounded in the possibility of serious harm to children's health in the absence of scientific "proof". (The recommendation was accepted with alacrity by the government in the run up to the 1983 General Election). But one can also trace a more general shift towards precaution, exemplified by the Commission's treatment of water pollution and of chemicals in the environment.

In the case of water, the Commission became convinced over time that "[t]he question of how much waste can be disposed of to the environment without adverse impact should be preceded by asking how far the pollution from a process can be reduced" (RCEP 1992: para 9.44). From its earliest days it was concerned about limits to the assimilative capacity of the environment – even that of the seas which might seem vast – and was worried about irreversible impacts: "there could be points of no return in the deterioration of water" (RCEP 1972b: para 10). By the mid-1980s, when Britain was staunchly resisting European pressures for stringent control of dangerous water pollutants at source, the Royal Commission urged reconsideration:

"the United Kingdom should reappraise its stance on irretrievable discharges to the sea of toxic substances which are unarguably persistent and bioaccumulative" (RCEP 1984: para 3.26). The UK did indeed shift to technology-based controls, at least for a restricted "Red List" of substances, in 1987. Later the Royal Commission argued for a more general extension of the precautionary approach in the context of water pollution (RCEP 1992).

Another example of a general shift towards precaution can be found in the Royal Commission's treatment of chemicals in the environment. In its second report, it argued for a degree of circumspection in launching new products that contained substances with potentially hazardous properties: "While it would not be reasonable to regard substances with these properties as 'guilty until proved innocent' it is reasonable to regard them as 'under suspicion'" (RCEP 1972a: para 13). This should be reflected in toxicological testing in advance of marketing and monitoring for environmental impacts afterwards. During the 1970s and 1980s, the Commission was influential (behind the scenes as well as through its reports) in institutionalising arrangements for the control of agricultural pesticides. By 2003, it was expressing concern about the tens of thousands of chemicals about whose impacts very little is known, and arguing for a paradigm shift in the slow process of assessment. Since uncertainty has to be regarded, at least for now, as inherent, the Commission recommended "a precautionary approach based on substitution of hazardous chemicals with ones of lower hazard or a non-chemical alternative" (RCEP 2003: summary p. 5).

The work of the Royal Commission illustrates a number of important points about the precautionary principle. One is that it is tempered in application by other principles. Perhaps the most significant is the principle of proportionality, requiring that measures taken should be proportional to the potential threat, and should take account, as far as possible, of the costs and benefits to society of the action or inaction involved: acting "ahead of the evidence" does not mean acting "whatever the cost". Proportionality was part of the context for the original (West German) *Vorsorgeprinzip*, which influenced the Royal Commission's thinking in the 1980s (RCEP 1988). One might argue that the Commission's radical recommendation on lead in petrol was facilitated by its finding that the phasing out of lead additives could be achieved at modest cost: in effect, it sidestepped the intense scientific controversy about causal links with human health by asking two simple questions: "do we need lead in petrol? and how much would it cost to take it out?" Later, the Commission was to argue that "the strength of the economic or technical case for [a] substance's continued use" should be among the criteria for any shift in the burden of proof about possible harmful effects (RCEP 1984: para 2.31).

A second important point is that the precautionary principle is not something to be set apart from "sound science". Its proper application must involve some assessment of the plausibility and magnitude of the threat, and should be based on the best information that a rigorous scientific analysis can provide. But the principle is grounded in a recognition that, certainly in the case of many environmental controversies, we are dealing not only with uncertainties (which might be reduced over time) but with indeterminacies and ignorance, placing some of these issues into the realm that Weinberg (1972) described as "trans-scientific". In such circumstances, the principle of precaution can be seen not as an alternative to science but as "a rational response to uncertainties in the scientific evidence relevant to environmental issues and uncertainties about the consequences of action or inaction" (RCEP 1998: para 4.44).

Nor is the precautionary principle an alternative to risk assessment: its application *entails* an assessment of risk. But in making this connection, we must acknowledge that thinking about risk itself has changed. Most notably, the old dichotomy between "objective" and "perceived" environmental risk (which featured in some of the Royal Commission's earlier reports) has been substantially undermined, and the "information deficit" model of public risk perception discredited (Owens 2000). Particularly in the case of complex systems, we now appreciate that "risk estimates, often presented as the objective outcome of a scientific assessment, may involve important (but often obscure) assumptions and value judgements" (RCEP 2003: para 1.21). We have also come to understand that public responses to risk are not necessarily "irrational" but are crucially dependent both on context and on trust in institutions.

The final point follows from the others. Those who look to science alone to make difficult decisions in environmental policy must inevitably be disappointed. Application of the precautionary principle should of course be informed by science, but "must of necessity make heavy demands on judgement" (RCEP 1998: para 2.31). Like all important principles guiding human affairs, precaution is essentially an exercise in practical reason. This has two important implications. First, action taken in its name "should be transparent and subject to review in the light of development of understanding" (*ibid*. para 4.48). Second, acceptable risk and appropriate precaution are not matters to be determined by experts alone, but should properly be subjects for public and political debate in a mature democratic society.

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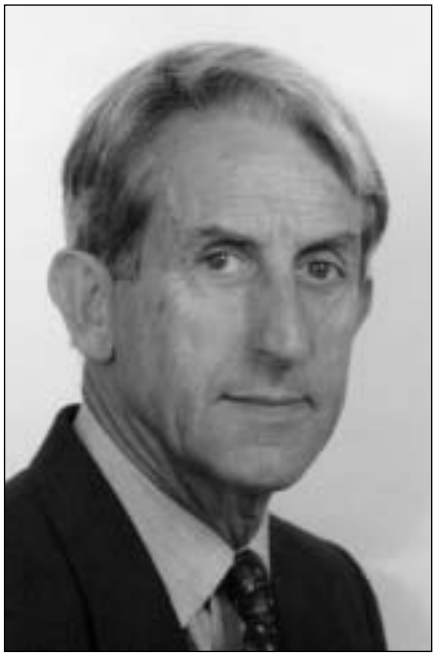
RISK MANAGEMENT – SHOULD THE PRECAUTIONARY PRINCIPLE BE REPLACED BY RISK-RELATED ANALYSIS FOR INDIVIDUAL NEW TECHNOLOGIES?

The Precautionary Principle – more sorry than safe

Sir Colin Berry
Emeritus Professor of Pathology
Queen Mary, University of London



In managing the risks that beset us, of infectious and degenerative disease, accidents in the home, the problems related to various means of transport or the actions of other living beings, it is proper that we use **Caution**, the taking of heed and **Precaution**, the use of prudent foresight. No system of regulation or pattern of avoidance of risk can give an **Indemnity** enabling the prevention of contingent harm. The desire for certainty about hazards and new technologies has led to the development of scientifically flawed ideas, including the Precautionary Principle. Despite the obvious impracticability of an indemnity, changes in society that lead to a risk-averse view of life have become prevalent; as **Frank Furendi** has it, "the defining feature is the belief that humanity is confronted by powerful and destructive forces that threaten our everyday existence". Part of this thinking comes from a profound underestimation of the real risks that confront us and it follows from this that the presentation of a hazard that might produce a low level and remote risk assumes an unreasonable significance.

This is abetted by a lack of understanding of the scientific method in the untrained, often illustrated by a tendency to over-value single steps in a chain of causation. The dependence of an hypothesis on a complete chain of confirmed steps is counter-intuitive to many and has been commented on by non-science writers such as PJ O'Rorke. It is not easy to provide instant certainty with science and Bertrand Russell's dictum that "what man desires is not knowledge but certainty" is relevant. In 2001, the apparent discovery of trans-gene migration in Mexican maize by Quist and Chapela (2001) reported in Nature caused considerable alarm to some. I do not mean to discuss whether the technique they used was faulty (or better, inappropriate) nor to consider whether trans-genes would be expected to persist but the later study of Ortiz Garcia et al (2005), who found no transgenes in 150,000 samples over a four years' study period illustrates the danger of acting on unverified information. In the same way, initial reports on the dangers of a GM crop to the Monarch butterfly were discredited

Similar concerns apply to the controversy about the MMR (measles, mumps and rubella) vaccine where a set of indifferent data was made much of by the uninformed. Even had the hypothesis been true, the suggested hazard (there were no data to describe a risk) should have been balanced against the facts – to consider measles alone; it is highly contagious and will occur in outbreaks in communities with immunisation rates much below 75-80%. The illness will be accompanied by ear infection in 1 in 20 cases; by pneumonia or bronchitis in 1 in 25 cases (with some permanent sequelae in terms of lung disease); by convulsions in 1 in 200 cases; meningitis or encephalitis in 1 in 1000 cases; death in 1 in 2500-4000 cases; and the terrible problem of sub-acute sclerosing panencephalitis in perhaps 1 in 8000 children.

But there is a better documented example of the precautionary advice being damaging. In the years between 1986 and 1988 there were around 1500 deaths described as belonging to the Sudden Infant Death Syndrome (SIDS) in England and Wales per year. In 2004 there were 313. What had happened?

Perhaps as a result of the view that the immature brain stem function of infants made them vulnerable to certain stimuli affecting the airways it was assumed that it would be sensible to sleep infants on their front or side, in the way it was accepted that it was better to nurse unconscious or vulnerable adult patients. At that time there was also an increasing use of intensive care methodology in premature

infants. This practice was precautionary – there were no data. After a great deal of investigation, some absurd hypotheses and irritation with funding bodies (such as the Medical Research Council) that they were not doing enough to investigate the problem, a series of observations, mainly Australasian, demonstrated that this position was dangerous. The "Back to Sleep" campaign resulted in a drop in SIDS that has continued (0.65 deaths/1000 live births in 1996, 0.55/1000 in 2000 and 0.43/1000 in 2004). Blair (2003) estimated that the change in policy had saved 10,000 infant lives in the last decade; my own estimate is higher. It is important to notice that the main epidemiological characteristics of these cases has not changed (marital status, maternal age etc – see Leach et al, 1999) although a change in practice by some Coroners in the description of SIDS vs an "unascertained" course of death in death certification may have altered the figures in a very small fraction of the cases.

Although this tragic loss of precious lives is the price of precaution without information, there is a more important issue for Science as a methodology. The "background noise" of these deaths had obscured a significant number of deaths caused by overlying in those sleeping with their infants. Further advice last year (2004) from the Department of Health has further reduced unexplained deaths in infancy from a cause that any pig farmer would have anticipated from his data.

There are plenty of other exploded certainties relating to both therapies and diet, some documented in Ruth Gilbert and her colleagues' review of the SIDS issue (Gilbert et al, 2004), readily illustrated by the β-carotene and anti-oxidant story and by increasing difficulties with the "5 a day" mantra. Here again inadequate science may obscure the real value of a concept; there are good data on the benefits of some types of diet for populations but they often fail to confirm their promise in trials (as for carcinomas of the breast and colon). I have recently examined a PhD thesis from New Zealand by Dr Barbara Thompson, a food scientist from New Zealand, which may explain why; it is possible that the advice given with relationship to fruit and vegetable intake may need modification.

It is possible to provide endless examples; perhaps the most recent a conjunction of interest about the effects of PCB's and the concern about flame retardants – the 309 survivors of an Air France A340 Airbus crash in Toronto might have a view on this.

Apart from problems with the PP and its essentially non-scientific nature, its erratic application is a major difficulty. Why is the PP applied to GM crops but not organic food? I know of no regular monitoring scheme for mycotoxins in these foods yet food-related mycotoxin toxicity is a well established phenomenon and fungicide treatment has been demonstrated to prevent it. A number of papers have demonstrated the consequences of failure to treat (notably well documented in root crops). Why are some "natural" products not subjected to precautionary regulation when we have the REACH initiative? I suspect that we have a "mind-set" problem; it is obvious to some that particular things are dangerous. Professor Ernst in his survey of 95 British Complementary and Alternative Medicine (CAM) organisations found that few understood the concept of adverse reactions and some said that "adverse events were only connected with mainstream medicine, but were inconceivable in their own practice". This despite L-tryptophan and the eosinophilia/myalgia story (with many deaths), germanium and selenium and renal toxicity, the loss of a transplanted heart to St Johns Wort and deaths from Asinasin (a new vegetable juice) and from a Chinese herbal dieting regime.

I have concentrated on the problems of bad science, is there an alternative? The definition of the PP that I have used dwells on possible causative links that have occurred as a possibility to someone but have not been established. This is irresponsible; when so many examples of getting it wrong exist. It is possible to estimate risks for most interventions as well as for new technologies and thus to design monitoring studies that would enable a response to be modified if adverse outcomes are the result of an initiative. In the first report on Risk from the Royal Society (the second is not nearly so good) there was a category of "Risks not Foreseen". There is no system to protect us from these – attempts to do so will be stultifying.

In discussing those who should rule the Republic, Plato was emphatic that they must be an elite. There were three classes of citizens, the Guardians who ruled the polis, the Auxiliaries who were guardians who remained warriors, and the Craftsmen (the rest). In order to ensure that the leadership of the Guardians was accepted by the citizens a "noble lie" was told about their origins – that they were all born of the same mother but that some had gold in their souls, some silver and some bronze, determining the role they would play in society. This myth was told "for the sake of those being ruled". That is how we are beginning to regulate. The study of Trewby and his colleagues (2002) shows that we are in danger of destroying a trust by assuming we can decide what is good for people. We may be able to give good advice; but only if we have data.

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RISK MANAGEMENT – SHOULD THE PRECAUTIONARY PRINCIPLE BE REPLACED BY RISK-RELATED ANALYSIS FOR INDIVIDUAL NEW TECHNOLOGIES?

The present and future European use of the precautionary principle

Professor Ragnar Löfstedt
Director King's Centre for Risk Management, King's College

Introduction

The precautionary principle is one of the main regulatory tools of European Union environmental and health policy with important ramifications for member states. Over the past twenty years the precautionary principle has also increased in popularity beyond Europe, underpinning international agreements such as the Convention of Biodiversity. The precautionary principle has not been welcomed by all regulators in all governments as the use of the principle for regulatory purposes is highly controversial. This paper analyses the use of the precautionary principle and provides insights regarding its future use in Europe.

Sweden

The first use of the concept in law was the 1969 Swedish Environmental Protection Act. This introduced the reversed burden of proof with regard to environmentally hazardous activities. Industry was required to demonstrate the safety of its products to regulators, rather than requiring regulators to prove harm, as was the case in existing regulatory regimes. In effect the whole act is based on the burden of proof concept. As Westerlund 1981 writes:

"The idea is that the authorities do not have to demonstrate that a certain impact will occur. Instead, the mere risk (if not too remote) is to be deemed enough to warrant protective measures or a ban on the activity. Coupled with this is a rule in the Act stating that anyone applying for a licence must demonstrate the effects of the activity."

The purpose of the Act was to protect public interests, both environmental and public health. The concept was not called "precautionary principle" at this stage, but the core element, namely reversal of proof, was put to legal use.

West Germany

At about the same time, the German government began to develop a less radical version, *Vorsorgungsprinzip*, or "cautionary principle". This variant emerged from the Social Democrat-Liberal Democrat election victory in 1969, won partially on an environmental platform, as well as a promise to promote a fairer society. The use of the term precautionary principle was a way to address both issues, as its implementation led to a move away from economic criteria and all the legal implications associated with this approach. With regard to environmental legislation, the first draft of the new clean air act in 1970 contained the statement that translates into English as "to prevent the development of harmful effects". Interest in the environment was driven not by public pressure but by the Liberal Democrat Hans Dietrich Genscher to establish the party's environmental credentials. Environmental affairs were treated as a federal responsibility and moved from the Department of Health to the more powerful Ministry of Interior (BMI), headed by Mr Genscher.

German industry, as well as the Christian Socialist Union (CSU) and Christian Democratic Union (CDU), became more receptive to the precautionary principle, possibly as they had power bases in Bavaria and Baden-Wurttemberg which have most of the country's forest cover, car manufacturing and nuclear power plants. The link between Waldsterben (Forest death) and auto emissions created conflict between the environment and economic growth. Promoting nuclear power, as an alternative to fossil fuel power plants, provided a way to reduce pressure on the auto industry.

Ironically, this invocation of the precautionary principle endorsed a technology surrounded by greater uncertainty than the one it was intended to replace. Nonetheless, it reflected a conceptual change, advancing a more holistic perspective to investment and R&D strategies. The new incentives were intended to encourage "ecological modernisation" in which environmental protection and economic development became mutually reinforcing. They were also designed to stimulate applied industrial research and open export markets for German environmental technology

Europe

The precautionary principle was discussed internationally as early as 1982, at the World Charter for Nature. However, the first significant use of the concept was in relation to the North Sea. As a result, most discussion regarding the precautionary principle has focused on the marine environment. At the same time Germany was also lobbying the European Union to have the principle adopted as its standard for environmental policy as well. This was part of a drive to "Germanise" European environmental policy by means of political initiatives at the EU level aimed at minimising

administrative adjustment costs which were expected to follow from the Single European Act. The German version of the precautionary principle was increasingly used in European environmental legislation, culminating in its inclusion in the 1992 Fifth Environmental Action Program and the 1992 Maastricht Treaty.

Present use of the precautionary principle

The precautionary principle has been used at member state and EU levels with mixed results. Sweden has been one of its most active proponents where industry has been operating under a strict reversed burden of proof, "substitution principle" and needs-based regulatory environment since 1969, ensuring that the country's regulations are more stringent than those of other European nations. Examples of such legislation include the banning of antifouling paints for pleasure boat owners, the banning of the domestic use of glysphophosphates (a common weed killer sold under the trade name "Round Up") and the proposed banning of all brominated flame retardants. The country is proposing to put into place a toxic free environment by the year 2020, by which time all concentrations of "artificial" chemicals should be at natural background levels.

The precautionary principle was increasingly used at the EU level as a "philosophy" for regulation. For example, in the period from 1994 to 1999 the term precautionary principle was referred to in 27 European Parliament resolutions. The most public European use of the precautionary principle has been associated with high level EU-US trade disputes ranging from European bans on hormones in beef to genetically modified organisms. These disputes led US business interests to take the view that elements within the EU were using the precautionary principle for protectionist purposes. Indeed, the contentiousness of this issue led the DG Environment Commissioner, Margot Wallström, to state in a recent Washington speech that: "We do not spend our days in Brussels, as some might think, in Machiavellian plotting to apply precaution to the detriment of US businesses." The European Commission therefore saw the need for an official clarification on the role of the precautionary principle in present regulatory policy. This is highly regarded within European Commission and places the precautionary principle within the existing framework of risk analysis to the displeasure of many environmental non-governmental organisations (NGOs) including Greenpeace.

Speculations on the future of European regulation

European regulatory politics changed after the formation of the Barroso Commission in late 2004, which is seen to be very much centre-right, with more attention devoted to reduction of regulatory burdens on industry to ensure European competitiveness. There is little consensus on further use of the precautionary principle in its strictest form, that is reversed burden of proof and regulation based on harm rather than on risk. Tools to promote better regulation such as Regulatory Impact Assessments (RIAs) are also very much in favour at present with the precautionary principle almost never mentioned at the European level.

The French Food Authority's decision to continue with the British beef ban following the EU decision to lift it indicated that the agency had the public's best interest at heart especially after the tainted blood scandal. The EU's precautionary actions also have a great deal to do with credibility and range from banning hormones in beef, to not introducing genetically modified crops on a commercial scale in Europe, to imposing hazard rather than risk criteria with regard to the forthcoming chemical legislation. The regulators want to be seen as acting in the best interest of the general public and not industry. In so doing they may be perceived as fair, one of the three components of trust, and thereby ultimately these agencies will, if all goes to plan, regain the public's trust that they have lost over the past 10 years.

Arguably the US underwent the same crisis of legitimacy with the same form of strategies in the early 1970s which the European Union is undergoing, albeit 30 years later. European regulators have therefore put forward the precautionary principle (specifically reversed burden of proof) as one of the main regulatory philosophies. Once trust is restored, and once regulators see that the costs of precautionary legislation outweigh the benefits of it (as occurred in the United States) then the popularity of the precautionary principle in European circles will decline and a more US based model will appear. The question is, of course, when will this occur? How much precautionary principle legislation needs to be enacted before regulators, as in the United States, see that the costs of regulation outweigh the benefits of it? There are already signs that the EU is considering going in this direction with the development of the better regulation agenda within the Barroso Commission.

In discussion the following points were made:

The application of the precautionary principle has peaked in Germany where it arose prior to the environmental movement and was adopted and monopolised by them. It is based on ideology rather than on sound science and should now be sidelined. The application of the precautionary principle to ban the importation of cattle treated with hormones could be justified by economic reasons such as the existence of beef mountains in the EU. The banning of groundnuts from Africa on the basis of aflatoxin contamination with a one in a hundred million chance of contracting cancer from this exposure may be related to trade protection. A discussion on the relative benefits and impacts of the banning of flame retardants on infant deaths followed.

The precautionary principle is difficult to characterise and risk is difficult to quantify. All one can do is to obtain the best possible data in every case since perfect knowledge can lead to perfect quantification. Most developed countries tend to be more precautionary. Although absurd examples of inappropriate application exist and there are no perfect answers.

The current handling by the media on bird flu was quoted as an example of the hysterical mishandling of scientific data that undermines the scientific assessment of risk and its management.

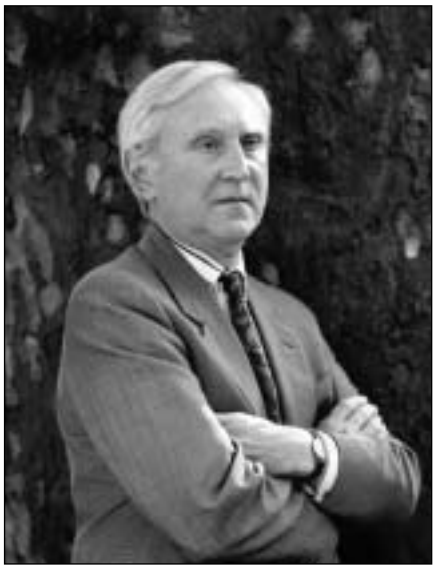
The precautionary principle is concerned with harmful outcomes, but positive outcomes are the primary objective of technological development such as the laser for example, on which so much technology now depends, but which could have been banned as a potential weapon of destruction.

THE IMPORTANCE OF SCIENCE, ENGINEERING AND TECHNOLOGY TO A SUSTAINABLE ECONOMY ON THE AFRICAN CONTINENT

MEETING OF THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE ON MONDAY 12TH DECEMBER 2005

Africa has the shortest average human lifespan for any continent, partly attributable to the incidence of HIV/AIDS and Malaria in Sub Saharan Africa. These conditions are aggravated by a generally weak economy and fragile environment that will be further challenged by future climatic and demographic changes. According to the United Nations Economic Commission for Africa (UNECA) these will combine to reduce the average water resources to less than 1700m^3 per person, per year, throughout most of the continent by 2025. Current aspirations for the elimination of poverty in Africa are therefore unlikely to be achieved unless underlying factors such as current and predicted water scarcity are addressed now. The combined deployment of Science, Engineering and Technology with Development Aid would therefore appear to be a very high priority if the structural causes of poverty in Africa are to be identified and rectified. Is this on the donors' agenda?

The Importance of Science, Engineering and Technology to a Sustainable Economy on the African Continent



Sir Crispin Tickell GCMG KCVO

The human species may have arisen in Africa, but Africa was – and is – no garden of Eden. It has a wide variety of environments, but probably remains more vulnerable to environmental change than any other continent. The special position of Africa has now been widely recognised, notably in its place on the agenda of the G8 countries at their meeting at Gleneagles in July. While living standards have recently increased in many countries, both GDP per capita and wealth per capita in Africa have actually declined between 1970 and 2000.

We live at a time when the world we are used to is anyway changing quicker than ever. It has changed more in the last 200 years than in the preceding 2000, and it has changed more in the last 20 years than in the previous 200. The problems are of course global. They date mostly from the industrial revolution which began around 250 years ago. The main global problems are:

Human multiplication at an extraordinary rate: when I was born in 1930 there were around 2 billion people, but now there are more like 6.3 billion, and the number could rise to between 8 and 9 billion by the middle of the century. At present there are 80 million more people every year.

There has been extensive land degradation through deforestation and over-cultivation. We have depleted mineral and other resources, and accumulated a rising volume of wastes.

Climate is changing as a result of human activities, with consequent variations in hot and cold, rain and drought, more extreme events, and rising sea levels. Melting ice in the Arctic and Antarctic, and the hurricanes Katrina and Wilma are good illustrations of what is happening. Coping with the problem (principally by drastically reducing carbon dioxide emissions) carries big implications for energy policy. Kyoto and plans for post-Kyoto are only modest steps forward.

Water, both fresh and salt, has been polluted world-wide, and there are growing freshwater shortages, described by the UN Environment Programme as the biggest problem of the twentieth century, and a possible source of conflict.

There has been a reduction in the diversity of living organisms, and thus of the global ecosystem of which humans are a part. In this area we are ignorant of our own ignorance.

New risks have arisen from the development of technology, whether in the nuclear or chemical fields, in nano-technology, in genetics, or elsewhere.

All these problems are closely connected. I commend the September edition of the *Scientific American* which, under the headline **Crossroads for Planet Earth** examines each of the main issues, including agriculture and food security, deterioration of land quality, and public health.

Nowhere do these global problems have more effect than in Africa.

The African population is likely to triple between now and 2050. Estimates suggest that it will increase by 63% in North Africa, 122% in West Africa, 175% in middle Africa, 136% in East Africa and 4% in South Africa. This will lead to increasing numbers of refugees, both within and between countries, and major social and economic instability.

Climate change is a particular hazard and has long been such. Throughout the Holocene there have been big variations with such factors as the El Nino/La Nina phenomenon in the Pacific (with global implications) to be taken into account. The conventional wisdom is that the droughts of the last 40 years, particularly in the Sahel and East Africa, arise at least in part from over-population, poor land management and deforestation. But recent evidence suggest that at least some of the problems arise from changes in the monsoon, due to rising temperatures in the Indian Ocean, in turn due to global warming caused by the rising volume of greenhouse gases. This is scarcely an African responsibility. Sealevel rise contains many hazards for coastal cities where increasing numbers of Africans now live.

Damage to soils and a steady increase in desertification are also forecast for Africa.

Shortages of fresh water are likely to increase dramatically throughout Africa by 2025. In 2000 about 300 million Africans were living in a water-scarce environment, but by 2025 this figure could triple. Sanitation is another major problem.

With water shortages is likely to come substantial changes in both terrestrial and aquatic ecosystems, with effects now hard to estimate. Distribution and productivity of plant and animal species will change with big effects on food security and human health. We are as vulnerable to change as any other species. Humans take 20 years to reproduce while bacteria can do the job in 20 minutes. The spread of such old diseases as malaria and dysentery and of such new ones as HIV/Aids and the Ebola virus can be devastating in a weakened population.

Misapplication of technology, particularly in agriculture, is another major problem. Well-meaning efforts to change traditional crops, or increase crop yields, have often led to disaster, for example in Ethiopia.

So far efforts to cope with this alarming range of interconnected problems have had little success. They tend to be associated with problems of government, governance generally, poor infrastructure, local conflicts and corruption. Capacity building is always a long and difficult process, and has hardly started in Africa. Others will talk about the progress now being made, and the role of DFID.

It is good that the African Union and NEPAD (the New Partnership for Africa's Development) have been working together. Progress was made at the second African ministerial conference on science and technology in Senegal in September when a consolidated plan of action with twelve flagship programmes was agreed. These programmes include projects in biotechnology, water, information technology, and use of raw materials. In South Africa new scientific networks across the continent are being promoted through the National Astrophysics and Space Science Programme and a new African Institute for Mathematical Sciences.

How quickly science and technology can contribute to producing a more sustainable economy in Africa is anyone's guess. The first step to wisdom is recognition of the problems, but what to do about them runs up against cultural and other barriers, for example in coping with population increase and land use. The devil lies in the detailed application. As an example I looked at the particular problems of one of the poorest African states, Burkino Faso. Here a charity, Tree Aid, has found that one of the most serious problems is the gap between understanding of the issues at the top of the social hierarchy, and willingness to tackle the problems lower down. While some farmers have been willing to innovate, and in particular to restore tree cover where possible, they have had little support from either colleagues or local government officials.

The most useful contribution which anyone from outside can make is to help Africans to help themselves in their unique geographical and ecological circumstances, and to assist them in their efforts to create balance between population, resources and environment. This involves a wide range of issues, including trade. What industrial countries do globally greatly affects Africa, and what the African countries do locally greatly affects the rest of the world. We have an enormous common responsibility.

THE IMPORTANCE OF SCIENCE, ENGINEERING AND TECHNOLOGY TO A SUSTAINABLE ECONOMY ON THE AFRICAN CONTINENT

What Can Water Science and Technology do for Africa?

Frank Rijsberman
Director General, International Water Management Institute, Colombo, Sri Lanka

The Role Water Plays in Africa's Challenges

At any given time, close to half the population in the developing world is suffering from one or more diseases associated with inadequate provision of water and sanitation services[1]. Diarrhoeal diseases form the bulk of the health risk. There are an estimated 1.2 billion cases of diarrhoea in Sub-Saharan Africa every year that lead to the deaths of 769,000 children under 5. This places an average health burden on every African of 21.7 years of ill health. Diarrhoea kills more Africans every year than HIV/Aids.

Water is also closely linked with hunger and poverty. Some seventy per cent of the 600 million "$-poor" and the 200 million malnourished people in Africa live in rural areas, with agriculture as their sole or primary source of food and income. Agriculture is their only way out of poverty. Soil nutrient loss and lack of access to safe and reliable water are the chief biophysical factors limiting small farm production and therefore critical to any poverty reduction strategy for the rural poor.

State of Water and Land Management in Africa

If water plays such a key role in Africa's challenges, then why has it not been addressed already? Water resources development projects in Africa, particularly irrigation projects, have a reputation for being several times more expensive than Asian projects and for not delivering results. Have we learned from the past and do we know where to invest in the future, or is there a task for research, for science and technology, to develop such solutions? Jeffrey Sachs's proposal is clear: we have the answers and the key is increased investments. Others, such as Lomborg, question whether there are good investment opportunities where the benefits to society clearly outweigh the investment costs.

For water, however, both camps came to the same conclusion: (1) for water supply and sanitation we have excellent investment opportunities; and (2) for increasing water productivity in agriculture, developing innovative solutions through research is a good investment opportunity.

There are clear, simple solutions that are credible and widely supported for effective provision of safe and affordable water and sanitation services. These focus on community-managed, low-cost water supply (often standpipes) and sanitation (latrines in rural areas and low-cost, small-bore sewerage in some urban areas), combined with hygiene education (hand washing). For Africa to meet the 2015 MDG water and sanitation target, however, it will be necessary to increase the speed at which people are provided with safe and affordable water threefold and with sanitation fourfold. The key question is how to mobilise additional investment resources.

For irrigated agriculture there is a widespread belief that enough – possibly too much – has been invested. In the twentieth century there has indeed been massive investment. The governments of the United States and Australia, for example, constructed some five thousand cubic meters of water storage per capita. In Africa, however, very little water infrastructure has been built. South Africa has most (700), while Ethiopia has only 40 cubic meters. For all of Africa, only 3% of its hydropower potential has been exploited and less than 4% of its arable land is irrigated.

Rainfall in Africa is characterised by extreme variability. There is a very high correlation between rainfall and national economic growth, suggesting that economic growth could be stabilised if water infrastructure could even out water shortages. Africa is the only region in the world where per capita food production has fallen over the last forty years. In other regions agriculture has "intensified"; increased production has come from higher production per unit area. In Africa, however, it has come almost completely from expanding agricultural area, at the cost of the

environment. A key question for science and technology is how agriculture in Africa can be intensified, or how water and land productivity can be increased.

A comprehensive recent study by IWMI and partners shows that, surprisingly, irrigation projects in Africa are not very much more expensive than in Asia. Small projects are more expensive than large projects, however, and there have been many more small projects in Africa than in Asia. Projects with a 10% increase in irrigated area have a 7% lower unit cost and a 3% increase in economic returns. Key conclusions are:

1. Farmers ***are*** the private sector.
2. Large has a place: Large dams ***can*** be good and small dams ***can*** be bad.
3. ***Farmer participation*** in irrigation O&M makes for better projects.
4. Success depends highly on ***other sectors***: fertilizer, roads, markets, output prices.
5. ***High-value crops*** (vegetables, primarily) outperform staple foods by a considerable factor.
6. Have ***multiple-use*** projects: domestic ***and*** productive use (crops, fish, livestock, trees and environmental services).

The Role Science and Technology Can Play

In my opinion, two key opportunities for water science and technology in Africa are:

1. making an asset out of wastewater; and
2. increasing water and land productivity at the basin or landscape scale.

Making an asset out of wastewater

There are an estimated 20 million urban and peri-urban farmers in Africa that produce some 70-90% of the perishable vegetables consumed in African cities. Virtually all these farmers use un-treated, or very partially treated, urban wastewater. And virtually all these farmers are ignored by government because their use of wastewater is against official regulations and because their farming is informal and the farmers are illegal (squatters).

Nevertheless, wastewater irrigation is a reality in the urban fringes of virtually all cities in Africa and Asia. Re-use of wastewater has many advantages for farmers:

- it conserves nutrients and reduces the need for chemical fertilizers;
- it increases crop yields; and
- it is a very reliable water supply.

It also has considerable environmental benefits:

- it provides low-cost sanitary disposal of municipal wastewater;
- it conserves water; and
- it reduces pollution of rivers, canals and other surface water.

Re-use of polluted, unsafe water also does carry serious health risks, for producers and consumers, as well as environmental risks, however. The challenge for science and technology is to develop "safe" approaches for re-use of wastewater. This could make sanitation affordable for African slum dwellers, with major health benefits, while generating sustainable livelihoods for (peri-)urban farmers. The opportunity is to carry out action research in several African cities and demonstrate how sustainable (eco-) sanitation can be linked with sustainable agriculture.

Increasing basin scale water productivity

The official data on irrigation severely under-report informal irrigation undertaken by small farmers. For Ghana, for example, the official numbers report 9 thousand hectares while some 5 thousand hectares are actually irrigated. An IWMI survey in central Ghana shows there is at least some 45 thousand hectares of informal, small scale irrigation, however.

Another IWMI study of so-called "bright spots"[2] demonstrated that there are a range of technologies available that are used successfully by smallholder farmers to increase water and land productivity. These range from rainwater harvesting, to small-scale irrigation, to the integration of livelihoods opportunities (crops, livestock, fish, agro-forestry, ecosystem services). There is evidence that water can deliver a considerably higher value than what is currently produced. The challenge for science and technology is to integrate and scale up these successful technologies to the riverbasin and landscape scale. This approach focuses on small farmers, as private sector investors.

Conclusions

Poor access to safe and affordable water, both for domestic use and sanitation as well as to grow food and provide livelihoods, places an enormous burden on the health of poor Africans and is a major constraint to their escape from hunger and poverty.

To address this, there are excellent investment opportunities that focus on known and proven technologies. The key question is how to mobilise additional investment resources. An innovative solution, and a challenge for water science and technology, is to make an asset out of wastewater and turn the sanitation challenge into a food and livelihoods opportunity.

Increased investments in water resources development, ie water infrastructure, are a priority for Africa. Successful irrigation projects are not significantly more expensive in Africa than in Asia.
Opportunities for increasing water productivity at the basin or landscape scale exist. The challenge for water science and technology is scaling up these technologies with a focus on multiple use systems that optimise water productivity across domestic use as well as crop growth, animal husbandry, fisheries and aquaculture, agro-forestry and ecosystem services.

Footnotes:

[1] Diarrhoea, ascaris, dracunculiasis (guinea worm), hookworm, schistosomiasis (bilharzias, or snail fever) and trachoma.

[2] Bright Spots are areas in which communities are siginificantly more successfulin managing their natural resources than in neighbouring communities where resources are often severely degraded. IWMI analysed 286 Bright Spots in 57 countries, involving 12 million farmers

References are available from the author at f.rijsberman@cgiar.org, www.imwi.org

What the Dickens can Science and Technology offer Africa? A Tale of Two Villages in East Africa…

Richard C Carter, Professor of International Water Development, Institute of Water and Environment, Cranfield University

Context

Misheg is a highland farming village of a few hundred households in Central Tigray, Northern Ethiopia. Kisibo is a similar-sized rural community on the Uganda/Rwanda border. In both places crops are grown primarily for local subsistence – markets are distant and small – and the raising of livestock forms an important part of the farming system. Both communities experience seasonal water shortages and droughts, extremely high infant mortality (estimated at 300 per 1000 live births in Misheg), high levels of infectious disease, poor nutrition, and many other well-known aspects of chronic rural poverty which are endemic in sub-Saharan Africa.

Such poverty is not a static condition. Pressures from within – rapid population growth, leading to land fragmentation and degradation – combine with external pressures such as global climate instability and weaknesses in democratic processes and governance, to reinforce and exacerbate chronic poverty. If the pressure becomes too intense, disaster follows, in the form of silent suffering or better-publicised famine, with or without the controversial benefits of food aid.

Questioning the role of science and technology

So what can science and technology offer to Misheg and Kisibo, and the one million other villages in sub-Saharan Africa? Are these communities destined to remain poor, until their respective national governments become more democratic, educational provision becomes truly universal, and their national economies grow substantially? Or can science and technology transform rural African poverty from within? And if so, whose science and what sort of technology? Can science and technology provide strategic and long-term solutions in place of short-term development interventions or even shorter-term emergency relief efforts?

Technology, people and policies

In Misheg and Kisibo, and the many other similar African villages, technologies introduced from outside can have an impact which is disproportionate to their apparent level of sophistication. Cement rainwater tanks constructed by women's groups in Uganda are not only freeing up time and energy formerly devoted to water-hauling, but vastly enhancing self-esteem and the respect with which women are held in the community. Dry sanitation technologies which produce valuable compost from human excreta can start to reverse processes of soil nutrient degradation, while at the same time reducing groundwater and surface water pollution from human waste. In almost every case though, patient and careful efforts need to be made by external agents of change to bring about uptake of technology or new ways of doing things. These processes are time-consuming, and rely heavily on the commitment and motivation of external agencies, and the level of trust which can be established with communities. Science and technology in the narrow sense need social science and promotion of behaviour change to become effective.

What has often been ignored however, is that a community which moves from subsistence and almost total self-dependence into the technological age (using artefacts of cement, metals, and plastics, and requiring fossil fuels in their manufacture or maintenance) actually becomes more dependent on markets, suppliers and external agencies than hitherto. External support is needed for the forseeable future, to maintain technical or social infrastructure, and this support may have to come from Government, private sector, non-Government organisations, or some combination of the three. Technology may bring benefits to users, but it also places heavy demands on organisations which provide technical and management backstopping to communities.

"Appropriate" technology for these rural African contexts does not necessarily need to be of the "bamboo-and-bailer-twine" variety. The mobile telephone is proving to be a major contributor to democratisation, empowerment and corresponding development in sub-Saharan Africa. In Uganda, private sector competition and correspondingly low charges make the technology highly accessible. In contrast Ethiopia still retains a Government monopoly, and as a consequence there are only around one tenth as many mobile phones per head of population as in Uganda. Uganda is one of several African countries which are now offering market intelligence to rural farmers via SMS messaging – with potentially very significant impact on producer prices and rural incomes.

The need for integration

For a villager in Misheg or Kisibo, the day-to-day problems of poverty come as a package. A woman's day is dominated by fetching and carrying of water and firewood, farm work – weeding and hoeing, childcare, and caring for the family. A man may be more pre-occupied with providing staple crops and meat, earning income, and participating in village decision-making. Both need technologies which can free up time, save energy, provide opportunity for income-generation, and help to enhance the health, education and well-being of the family. External organisations need to be well-connected to these realities, and aware of their scope and detail, even if their specific interventions only address specific elements of the poverty and vulnerability of households and communities.

Local science, foreign science

The poorest subsistence communities in sub-Saharan Africa know far more than any foreign organisation (be it Government, research institution, development organisation, or donor) about their own environment and its vagaries. But that is not to say that foreign science is irrelevant. On the contrary, as internal and external pressures on poor communities continue to grow, the need for a stronger three-way partnership between communities and their indigenous knowledge, local research and development organisations, and foreign science and technology organisations becomes increasingly imperative. In some cases, foreign technology which attempts to control nature may be entirely ill-suited, while local knowledge which is better adapted to nature's uncertainties may be the only solution. In other cases, foreign technologies such as satellite remote sensing and other means of environmental monitoring may find a constructive synergy with local knowledge. The important point is to always assume that local science exists and has much to offer. Too often it has been ignored in the rush to "modernise".

Broadening the view of science

The specialised western educational curriculum, adopted in most African countries, puts artificial walls between natural science and social science, technology and its utilisation. If science and technology are to offer anything of value to villages such as Misheg and Kisibo, they must expand to embrace all relevant aspects of knowledge and its application. The science of "how things happen now" and the technology of "how things might be" requires scientists and agents of change who are willing to tackle the full breadth of the problems posed by poverty, and find solutions which will involve conventional and unconventional technologies and human behaviour change.

So what is to be done?

International science and technology support to African development needs to be re-oriented to focus increasingly (a) on home-grown solutions to individual countries' local poverty issues, and (b) on global issues such as climate change, renewable energy and communications technologies, and health issues such as malaria and HIV/AIDS which may benefit from solutions developed internationally.

If Misheg and Kisibo are going to emerge from quarter-dollar a day poverty, this will be through the efforts of Ethiopian and Ugandan institutions which facilitate problem-solving within those communities. Such national organisations in turn need long-term, predictable and reliable partnerships with international donors and expertise. They need strong encouragement to question, to observe, to experiment, to make mistakes, to learn, and to document experience – in other words to do applied science, to develop solutions to real poverty-related problems, and to share those solutions with others who are engaged in the same endeavour.

But at the same time they need the support provided by international problem-solving applied to global poverty issues. Global climate instability has probably been affecting impoverished rural communities in Africa for several decades already, and the prospect is for this to get worse. The energy needs of households and communities can only increase, against a background of increasing pressure on natural resources and land. Communications technologies have already started to show their potential to redistribute wealth to primary producers. Preventable diseases, or those whose worst effects can be ameliorated, contribute to Africa's high rates of infant and child mortality, and high mortality and morbidity in older age groups. Evidence-based policies, and corresponding spending decisions, can translate science and technology which is focused on global environmental and poverty issues into local outcomes.

Misheg, Kisibo, and a million other African villages can benefit from science and technology which is owned by national institutions, grounded in local issues, not hidebound by traditional disciplinary boundaries, freed from the constraints of what is deemed to be academically respectable, internationally networked, and aware of what global science can offer. But whether the "best of times" currently enjoyed in the materially wealthy one fifth of the world can ever be experienced by the "worst of times" villages typified by Misheg and Kisibo, may require something much bigger than even the most imaginative science and technology.

DFID's Commitment to Clean Water and Adequate Sanitation for All

Sir Gordon Conway, Chief Scientific Adviser, Department for International Development

Introduction

DFID is committed to helping developing countries achieve the Millennium Development Goals including water, which is also important for most of the other targets, and is as important as education and health. We are all essentially composed of water. In this at least we are all equal. Better water supplies reduce the burden of collecting and managing water in the home and help more girls to go to school. In Bangladesh, a school sanitation and hygiene education programme increased girls' attendance rates by 11%. Women's health also benefits from reduced water carrying and enables them to earn money and to look after their families. Close proximity to home of water and latrines reduces the opportunities for rape or attack. The return on $1 investment in sanitation and hygiene in low income countries is in the range $3 to $34.

Appropriate technologies, which are affordable, sustainable, practical, low risk and participatory, play a key role throughout our programmes. A good example is the treadle pump that lifts water for irrigation and is operated by a man or a woman stepping up and down on the treadles. They are now produced very cheaply by the private sector in several Asian countries, and increasingly in Africa. They are made affordable through micro-finance schemes and, because they are easy to maintain, they are a highly sustainable piece of technology.

The Secretary of State, Hilary Benn, spoke on World Water Day at the Royal Geographical Society in March where he made a commitment to the provision of clean water and sanitation having frequently witnessed in many countries, poor women and girls struggling to carry water over long distances to their homes. He was also aware that at current rates of progress the water target will not be achieved in sub-Saharan Africa and the sanitation target will be missed in both Africa and Asia, by almost a billion people.

The reasons for this include:

- Water and sanitation budgets for poor people are low
- Overall responsibility for delivering water and sanitation services is fragmented
- Donors and development agencies do not co-operate well
- Targeting misses priority areas
- Sanitation must be combined with hygiene promotion for best effects

The Secretary of State committed the DFID to doubling its funding for water and sanitation in sub-Saharan Africa from £47.5 million to £95 million per year by 2007-08 and urging progress from the EU and World Bank. DFID's overall expenditure on the water sector in 2004-05 was an estimated £200 million. Of this, DFID contributed an estimated £25 million to the World Bank and £17.5 million to the European Commission for water programmes. DFID's contribution to the African Development Bank's water sector budget is expected to increase rapidly from £3.5 million in 2004-05 to £18.5 million by 2007-08. DFID also funds NGOs such as WaterAid. We are working in Bangladesh villages with WaterAid to develop community led total sanitation. This has reduced diarrhoea, increased incomes and raised self-respect by completely eliminating open defecation and is a demand-led approach which is being replicated in India, Indonesia, Uganda and Zambia, without waiting for government subsidies.

Other partnerships include international research organisations and international partnerships such as the Global Water Partnership, the Water Supply and Sanitation Collaborative Council, the Water and Sanitation Programme managed by the World Bank and the Joint Monitoring Programme which is implemented by WHO and UNICEF.

The Secretary of State pledged on 22 March that, where the water MDG target is off-track in partner countries in Africa, we would make sure that there was a core donor group working on water and sanitation (and take the lead if we need to); map what donors and the government were doing, and assess

what more needed to be done; and make water and sanitation a central focus of our discussions with the government.

In the four African countries which are most off-track, he pledged to second people to boost capacity and find quick ways of increasing spending on water and sanitation. We have already identified the next steps to improve delivery. Let me give two examples:

In Ethiopia the government has published a water and sanitation strategy with increased emphasis on this sector. DFID provides funding to the government through budget support and is a member of the core donor group on water. We have offered a consultant to support Italy as lead co-ordinator for the EU Water Initiative, and are planning to second an expert to the Ministry of Water in early 2006. If additional direct funding is required, we will provide selective support to WaterAid, the World Bank or the African Development Bank.

In Nigeria donor co-ordination has been weak but is improving, led by UNICEF and the World Bank. Nigeria allocates 10 per cent of its national budget to water but there is still a huge funding gap; debt relief and better co-ordination provide important opportunities to close the gap. More focus is also needed on sanitation. DFID provides funding and has seconded a specialist to support UNICEF as the lead donor on rural water and sanitation.

DFID also provides funding to WaterAid, a small towns project and to UNICEF's girls' education project which has a strong sanitation component. These emphasise plans drawn up by communities themselves. Since 2004, over 250,000 people in local communities have benefited from new handpump-operated boreholes and 70 boreholes in schools and 1,200 latrines have been built. The aim is that this community-led planning process will be replicated elsewhere. The EU has recently agreed to provide €40 million to widen the programme to six more states. We have similar programmes in the Democratic Republic of Congo and the Sudan, and in eight other off-track countries.

At the regional level we are putting our money through the African Development Bank's Rural Water Supply and Sanitation Initiative, which aims to increase coverage in rural areas to 66 per cent by 2010 and 80 per cent by 2015; and also through the EU Water Facility that recently approved a second stage of funding worth €250 million.

Under the UK's Presidency, G8 leaders committed to implement the G8 Africa water action plan agreed at Evian in 2003, by increasing aid in the sector. They also agreed to better co-ordinate aid to improve its impact. DFID leads the EU Water Initiative Finance Working Group providing advice to regions on financing water and sanitation projects.

The Africa Water Supply and Sanitation Working Group is setting up discussions on policy and implementation in ten pilot countries each led by an EU member state. We have seconded a specialist to the European Commission to support the EU Water Initiative and will second a financial specialist to the African Water Facility later this year. We are increasing our support for the Nile Basin Initiative – an African-led example of regional co-operation and good governance of a shared water source. We are providing more specialist help, encouraging countries to share experiences and learn from each other, and making sure local community groups are involved in decisions about the use of water. Finally, we have produced an Asia Water Plan, which we will take forward with the Asian Development Bank and other partners. 60 million people across the region are at risk from water supplies polluted with arsenic. Fluoride also contaminates water in parts of India and China, and indeed in Africa.

DFID will prepare a further update on progress against the World Water Day commitments early in 2006. The update will set out how DFID will continue to make water and sanitation a priority in order to meet the challenge of achieving the water and sanitation targets in the developing world.

In discussion the following points were made:

Successful mining projects in Africa rely upon partnerships with important links to funding sources in the private sector that are, for example, supporting MSc students with a mining company in Kenya. Africa generally lacks infrastructure to manage irrigation compared with India, where hydropower generation is mainly used for pumping water to where it is needed. Dependence on expensive, imported fossil fuel should not be encouraged. The importance of solar energy is commonplace in Asia but rarely exploited in Africa. GNP is not a useful measure of success where human welfare underpinned by clean green growth is a better measure of what people actually require to help them to care for themselves. DFID provides core funds directly to governments with a donor group for each sector with support for NGOs and others in what is described as a twin-pronged approach. There are major capacity weaknesses in Africa, however, resulting in failure to deliver services where they are needed that require a partnership-based approach if they are to succeed. Development of direct contacts at the village scale is one example. The importance of the role of women was emphasised, as educators of children, especially young girls, managers of the main means of production – agriculture, as supporters of the elderly and as primarily responsible for contraception. Africa needs both high technology – vaccines, solar power, mobile phones, and low technology based on the productive use of water, which thereby releases children for education rather than as carriers of water. The overall environmental fragility of the African environment is due to the underlying granitic rocks which weather to barren silica sand grains forming a dustbowl, compared with India which is mainly underlain by basaltic lavas which weather to release essential nutrients to the soil.

Pharmacology: What is it and how is it important to the Health and Wealth of the UK?

C.Page, R.Hill J.Buckingham and G Henderson on behalf of the British Pharmacological Society

C.Page

G.Henderson

Pharmacology is defined as the study of the manner in which the function of living systems is affected by chemical agents[1]. The UK has a long established tradition of excellence in this field of medical science which is at the very heart of why the UK is still considered a world leader in the development of new medicines.

The British Pharmacological Society (BPS) celebrates its 75th year in 2006. From humble beginnings at our first meeting in the University of Oxford, we now boast an international membership which includes basic scientists and clinicians from both academia and the industrial sector. The BPS also publishes two of the leading scientific journals in this field. Our membership includes several Nobel Laureates, the current Chairman of NICE and many scientists who have been closely involved in the development of ground breaking medicines, some of which are household names. For example Sir David Jack FRS and his team at Glaxo was responsible for the development of a wide range of drugs including salbutamol (Ventolin) for the treatment of asthma, sumitriptan (Imigran) for the treatment of migraine and various glucocorticosteroids for the treatment of inflammatory diseases. Professor Sir James Black FRS, a Nobel Laureate pharmacologist, pioneered the development of beta blockers for the treatment of heart disease and he also developed the H2 blockers that have revolutionised the treatment of stomach ulcers. UK pharmacologists have also contributed to the development of numerous other drugs including antibiotics, anti-viral drugs, treatments for cancer and heart disease, as well as medicines for many other medical conditions.

However, there are a number of threats to this position. At the basic science end, new drug discovery requires a thriving academic base in pharmacology and chemistry, yet over the past decade Pharmacology Departments have disappeared from a number of UK universities, and many medical schools no longer examine specifically in the areas of pharmacology and clinical pharmacology[2]. The loss of clinical pharmacology is a particular problem given that over 60% of the elderly take at least one prescription medicine per week, 650 million prescriptions are issued per year in the NHS and many patients being admitted to medical wards take 10 or more medicines[2,3].

The consequence of this reduction in the academic base of pharmacology and clinical pharmacology is beginning to be seen in the wider community. It is estimated that 5-10% of all hospital admissions are due to adverse drug reactions, many caused by inappropriate prescribing and attributable to a lack of good training in pharmacology[2-4]. Indeed the Association of the British Pharmaceutical Industry (ABPI), in their response to the recently published Leitch Review of Skills, identified that its members were "finding it increasingly difficult to source certain types of graduate skills within the UK – especially those individuals with good chemistry degrees, toxicologists and in vivo pharmacologists. There is certainly a shortage of people wanting to work with animals generally; however, for in vivo pharmacologists there are additional issues concerning the cost of training, administrative workload involved with Licence applications (to the Home Office to obtain permission to work with animals) and under-funding of UK universities leading to fewer scientists being trained in this area".

The US FDA has also recently called for "strengthening and rebuilding of relevant disciplines (eg pharmacology and clinical pharmacology)" as part of its challenge to the scientific community to improve the current stagnation in bringing new medical products to patients[5].

J.Buckingham

R.Hill

Clearly pharmacological approaches to treatment are not on the wane and with an increasing life expectancy (in part due to pharmacological advances in the treatment of cardiovascular disease) giving rise to an ever larger population of the elderly increases the need for experts in all aspects of drug actions[2]. The real possibility of "Personalised Pills" in the near future has already started to capture the imagination and major scientific breakthroughs continue to appear from UK pharmacologists. Nonetheless, to maintain our competitive edge in this field there is no time for complacency and we must address the challenges facing UK pharmacology discussed above so that we will have even more to celebrate over the coming 75 years.

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Personalised pills
Norwich
Meeting at the British Association's Festival of Science

11-13 September
The challenges of drug discovery and development
University of Hertfordshire
4th James Black Conference

19-21 December
75th Anniversary Meeting
Oxford
This meeting will include symposia on novel approaches to treating bacterial infections, safety pharmacology, surrogate markers of brain disorders, the historical development of pharmacology teaching, the impact of biotechnology from a pharmacological and drug discovery perspective, cannabinoids, cardiovascular pharmacology and gender and mediator pharmacology, amongst others.

Visualising the Emotions of Living Kidney Donation

It's one thing knowing that your father's chances of survival rest on having a new kidney but it's quite another deciding to give one of your own. Mark had no doubts about giving his father, Gordon, the kidney he needed and even joked that he could have a kidney, at a stage when he was unsure that everyone has two!

Mark and Gordon have been interviewed and photographed for a new thought-provoking exhibition and portfolio, produced with an educational grant from Novartis Pharmaceuticals. The aim of the materials, which are freely available to renal and dialysis centres throughout the UK, is to raise awareness of the option of living donation and encourage discussion about living donation amongst family and friends.

Whilst more than 5,000 patients are waiting for a kidney transplant, there is an increasingly severe shortage of donor organs. And, although living donor kidney transplantation results in better clinical outcomes than deceased kidney transplantation, the rate of living kidney donation in the UK is only 28 per cent, compared to 50 per cent in the US and 90 per cent in Japan.

After spending time interviewing and photographing donors and recipients before, during and after the transplant, Dr Jennie Jewitt-Harris and Victoria Lush have produced this revealing portfolio of images which link with powerful personal quotations to offer a visual journey through the process of living donation. The thoughts, compassion and challenges of life are captured as those going through this life-changing process experience a roller-coaster ride of emotions.

The exhibition and patient portfolio have been put together with input and support from renal experts.

When I heard dad needed a kidney I just said 'OK mate have one of mine' and at that stage I didn't even know that I had two.

Humour helps us get through this.

Kidneys from live donors have the greatest chance of working well.

Involvement and encouragement have come from Mr Chris Rudge, Managing Director of UK Transplant, Lisa Burnapp, Consultant Nurse, Living Donor Renal Transplantation at Guy's and St Thomas' NHS Foundation Trust and Mr Andrew Ready, Transplant Surgeon at Queen Elizabeth Hospital, Birmingham.

Mr Chris Rudge of UK Transplant says, *"These new materials are an important step in raising awareness of living donor transplantation as an option for patients with kidney failure. They cut through the medical jargon that sometimes faces patients, relatives and friends and tells them what it's really like to go through it. It's an inspiring insight for everyone involved."*

Many of the quotes used in the portfolio also address the underlying concerns and misconceptions that people may have about living donation. The aim of using the quotes is to reassure possible donors and recipients that these are normal feelings and to put the emotions during the various stages of donation into context and perspective.

As one donor said, *"You can't worry about whether you might need a spare kidney in the future. You've got to deal with the problem you've got now, not the one you might never have."* Another donor stressed that, *"Some people think I'm brave – I just want a healthy husband back again."*

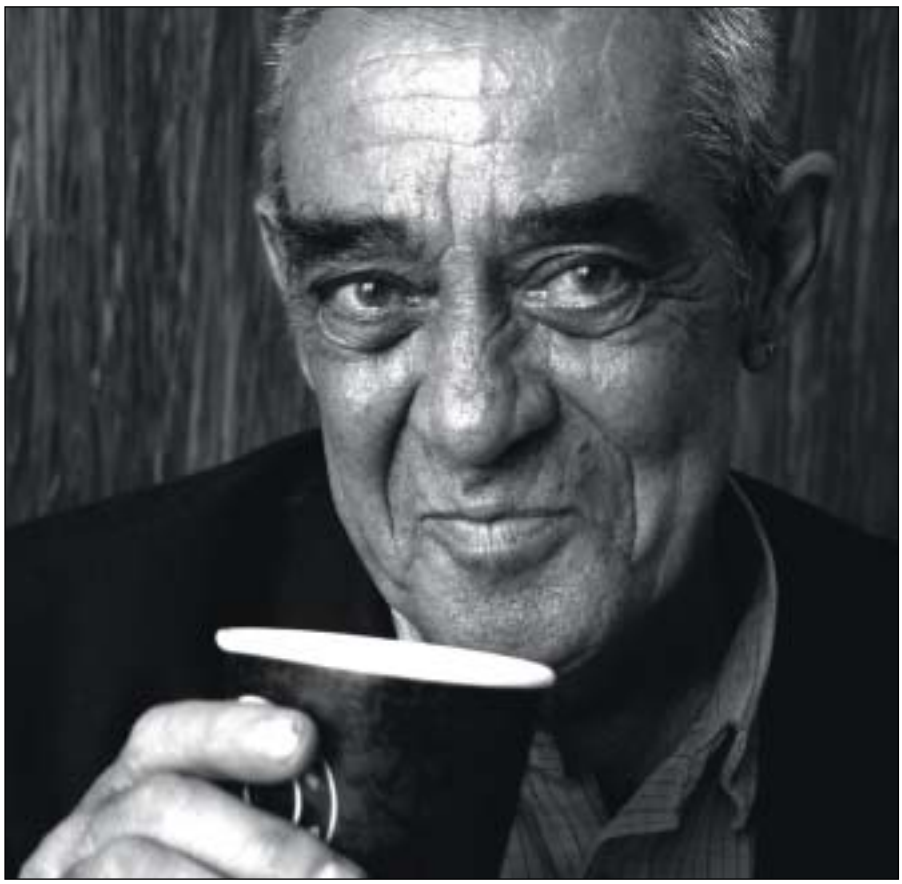
And as a recipient said, *"After the operation, all the lights were switched on."* Many patients find the mental and physical effects of life on dialysis difficult to cope with personally and find *"dialysis makes life difficult for the whole family, not just me."*

Others continually stressed the beneficial effects after transplantation of being able to lead a life without the ties of dialysis and as one recipient said, *"The joy of going on a normal family holiday is something I can't put into words."*

"Transplantation is very special and quite extraordinary. 18 months down the line and I still wake up feeling a surge of life."

Whilst not an option for everyone, to many, living kidney donation is *"the light at the end of the tunnel."*

Research shows that patients would like more information and this exhibition and portfolio are an important step in that direction. The "emotions of living donation" materials have been produced to give an honest and open visual account of the process of transplantation, that will encourage patients, their relatives and friends to talk about it.



After 3 months, I'm back running my pub. Regulars say I'm less short-tempered and more jovial now – they're right. That's how I feel.

If you would like a copy of the portfolio, or you would like information sending to hospitals within your constituency, please contact Nikki Bryant on telephone number 01276 692255 or via email nikki.bryant@novartis.com.

Hurricanes, Typhoons and Tropical Cyclones

Professor Paul Hardaker, Chief Government Advisor, Met Office

The name Hurricane originates from the word "Hurakan", a Mayan god, one of their creator gods, who it's said blew his breath across the Chaotic water and brought forth dry land, later destroying the men of wood with a great storm and flood. It's also said that a 17th-century Hurricane likely inspired Shakespeare's The Tempest and led to the British colonisation of Bermuda.

The recent Category 5 Hurricanes Katrina and Rita that hit the Gulf coast of the US in August and September last year reminded the world how powerful and destructive they can be. Fatalities as a result of Katrina have been estimated to be around 1,300. This is less than Hurricane Okeechobee in 1928 that reportedly killed over 2,500 people in the US, although Katrina is undoubtedly the most costly (in terms of loss of life and an estimated $200 billion financial damage) natural disaster in US history.

The naming convention began in the 1940s originally with women's names only. Since 1978, the United Nation's World Meteorological Organization (WMO) has used a pre-determined list of names for each ocean basin of the world, that for obvious reasons does not use the letters Q, U, X, Y or Z. When a storm like Hurricane Katrina strikes, that causes loss of life and/or widespread damage, the country most affected by the storm may ask the WMO to "retire" the name from the list as an act of respect – some fifty names have been retired since 1978 in the Atlantic basin alone.

So what makes a Hurricane?

To be precise it's actually a Tropical Cyclone. These are deep low pressure systems that occur in tropical or sub-tropical waters. They are tropical depressions at a sustained surface wind speed below 39 mph and become tropical storms when winds exceed this. When these winds exceed 74 mph, then they become severe tropical cyclones which, in the North Atlantic, we call Hurricanes (a name I will use generically hereafter).

For Hurricanes to form there need to be several favourable conditions, which include:

- the presence of warm ocean waters, that is temperatures at least as high as 26.5ºC and through a sufficient depth of at least 50 m;
- an atmosphere which is humid at mid levels (around 5km) and that promotes thunderstorm activity;
- a minimum distance of at least 500 km from the equator to maintain the rotation and the existence of an organised pressure system near the surface;
- low values (less than about 23 mph) of vertical wind shear between the surface and the upper atmosphere, so as not to disrupt the organisation of cyclone.

Of course, these conditions in themselves do not mean that a Hurricane will form, but they are necessary for development to occur.

Table 1: Regional terminology for Tropical Cyclones (after Newman, 1993)

Hurricane	the North Atlantic Ocean, the Northeast Pacific Ocean east of the dateline, or the South Pacific Ocean east of 160E
Typhoon	the Northwest Pacific Ocean west of the dateline
Severe tropical cyclone	the Southwest Pacific Ocean west of 160E or Southeast Indian Ocean east of 90E
Severe cyclonic storm	the North Indian Ocean
Tropical cyclone	the Southwest Indian Ocean

The destructive power of Hurricanes is typically measured in Categories 1 to 5, from the Saffir - Simpson Hurricane Scale.

Hurricane forecasting across the globe

The advent of satellite observations from the 1960s has meant that the global meteorological community is able to monitor and track Hurricanes as they move and develop across the oceans. However it is still a difficult process to predict their tracks with sufficient notice in order to provide useful warnings.

The WMO has a number of Regional Specialist Meteorological Centres (RSMC) that have the responsibility for issuing Hurricane warnings in their specific areas of responsibility. As the Met Office is one of the few National Meteorological Services in the world that runs a global weather forecast model it is able to provide Hurricane forecasts that support the work of the RSMCs.

Met Office forecasts are issued twice a day as "forecast guidance" to the relevant RSMC in the form of a 6-day forecast of the Hurricane track. Explicit forecasts of maximum wind speed are not given as the Met Office's model at present cannot resolve the wind field with sufficient detail. However, a qualitative indication of forecast wind strength is given based on relative vorticity (at the 850 mb pressure level in the atmosphere).

The Met Office's forecasts for Katrina were some of the most accurate forecasts available, and were the first to predict the correct location of landfall over the Gulf coast, some 3 days before it struck New Orleans.

The forecasts for Katrina were sent to the National Hurricane Centre in Miami (as the responsible RSMC for the Atlantic) who used these, along with those from other modelling centres in order to issue warnings. Like other RSMCs, the National Hurricane Centre looks at all available information and makes a judgement as to the most likely evolution of the Hurricane system. This type of "ensemble" approach uses the spread of forecasts to create probabilistic warnings, which over recent years have become more common place. The European Centre for Medium Range Weather Forecasting (ECMWF) creates itself an ensemble forecast of Hurricane tracks by using the same model run

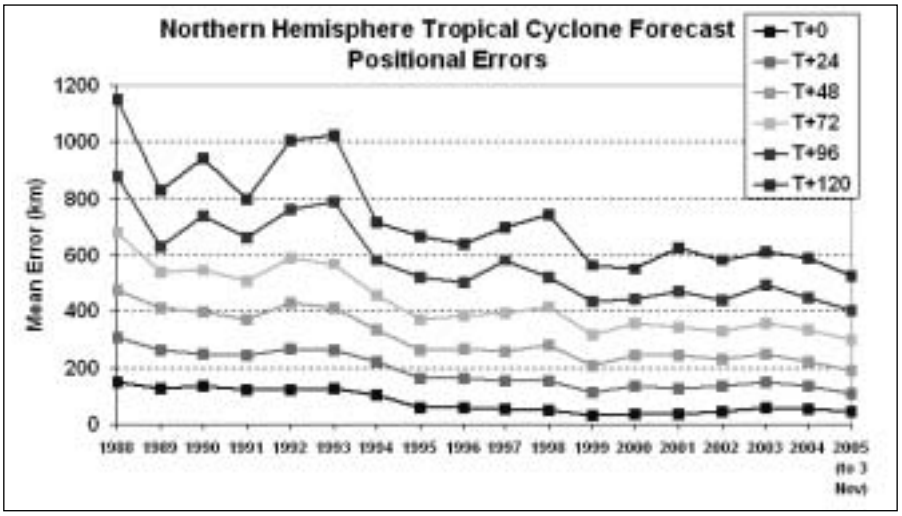


Figure 1. A plot showing the improvements over recent years in the tropical cyclone track forecast errors from the Met Office's Global Weather Prediction Model. The error is measured in km and each line in the plot represents a forecast lead time in hours, where T is an analysis field at the time of the forecast and T+24 is, for example, a forecast for 24 hours ahead."

many times with small changes to the initial representation of the developing system.

The Met Office's forecasts of Hurricanes are some of the best in the world. It regularly verifies the quality of these forecasts, in particular in terms of the positional error of the predicted Hurricane over time. Figure 1 shows the decrease in positional error in the forecasts from 1988 to present day, at 1 (T+24) to 5 (T+120) days ahead. Notice in particular the significant improvement in 1994, which resulted from introducing a new initialisation scheme, developed as part of a collaboration with the City University of Hong Kong.

What are the climate models telling us about how Hurricanes are changing?

Hurricane Katrina is the sixth most intense Hurricane in our observations history in the North Atlantic and was overtaken by Wilma and Rita – all occurring in 2005. Many people suggested that in the active Atlantic season in 2005 we were seeing the effects of climate change first hand.

Following Hurricane Katrina, Kerry Emanuel at MIT, one of the world's leading authorities on Hurricanes, hit the headlines with his paper in Nature on "Increasing destructiveness of tropical cyclones over the past 30 years" (2005). The press made big news of these new findings suggesting that Kerry had shown Climate Change was indeed causing Hurricanes to increase. Of course, that is not what he had shown.

We know that under a changing climate sea surface temperatures will increase, which is favourable for the formation of more intense Hurricanes. But we also know that this is not the only condition needed to encourage Hurricane development. Simulations with the climate models show that other criteria, like low vertical wind shear, are not necessarily favourable in a warmed climate.

In fact, attributing the increase of events like Hurricanes to human-induced climate change is almost impossible with current climate models. The current global models are too coarse a resolution to resolve features like Hurricanes. Some studies have looked at embedding higher resolution regional climate models within the global predictions, but can only give broad indications of trends that have a large degree of uncertainty. What the climate models can do is to look at larger scale tropical storm systems as a surrogate for Hurricane development, but as yet these studies are inconclusive and an active area of research.

What Kerry Emanuel has done is use historical observations of Hurricanes to look for trends in the data. His studies suggest that globally the annual frequency of Hurricanes has remained relatively constant at around 90. Although frequency varies from year to year across the different ocean basins there are no observed long-term increase trends. However what he has also suggested from his studies is that:

"Records of Hurricane activity worldwide show an upswing of both the maximum wind speed in and the duration of Hurricanes. The energy released by the average Hurricane (again considering all Hurricanes worldwide) seems to have increased by around 70% in the past 30 years or so, corresponding to about a 15% increase in the maximum wind speed and a 60% increase in storm lifetime."

Drawing conclusions from time series of Hurricane data is fraught with difficulties. Methods of observing Hurricanes have changed over time. Before the 1950s observations of wind speed are only available over land or from ships. After that reconnaissance aircraft brought back additional measurements. Then from around 1980 we began to have reliable estimates of wind speeds from satellites.

What has remained relatively constant though through time is the way in which pressure observations have been made, which can be related to Hurricane intensity. At present Kerry Emanuel's observations remain some of the closest indications we have that not the frequency but the intensity of Hurricanes has increased over the last 30 years – watch this space!

Table 2. The most intense recorded Hurricanes in the North Atlantic as measured by central pressure levels.

Rank	Hurricane	Year	Pressure (in millibars)
1	Wilma	2005	882 mb
2	Gilbert	1988	888 mb
3	Labor Day	1935	892 mb
4	Rita	2005	897 mb
5	Allen	1980	899 mb
6	Katrina	2005	902 mb

References

Emanuel , K. A., 2005: Increasing destructiveness of tropical cyclones over the past 30 years. Nature, 436, 686-688.

Neumann, C.J., 1993: Global Overview - Chapter 1. Global Guide to Tropical Cyclone Forecasting, WMO/TC-No. 560, Report No. TCP-31, World Meteorological Organization; Geneva, Switzerland.

Further information about the Met Office and its Hurricane forecasts can be found at 'www.metoffice.gov.uk' and 'www.metoffice.gov.uk/weather/tropicalcyclone/index.html'.http://www.britishembassy.de/S&I

House of Lords Science and Technology Select Committee

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

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

'Pandemic Influenza' – report published

In December the Select Committee published its report following a short inquiry investigating the UK's preparations for a potential outbreak of pandemic influenza. Overall, the Committee found that the UK is relatively well prepared for responding to a pandemic, but that that there remained much to be done.

Preventing the emergence of a dangerous new virus was found to be a crucial first line of defence. Improvements in healthcare facilities and disease surveillance in south east Asia are needed, with increased support to international agencies. In this country, the report recommends that the Government clarify their policy on the prophylactic and early use of antiviral drugs in the event of a pandemic. Members also heard how treatment and research into the disease may be hampered by regulations, and recommended that such barriers be dealt with, and suitable research projects prepared, before a pandemic strikes. Of serious concern to Members was the lack of detailed plans covering food distribution and retailing. The Committee heard how a shortage of HGV drivers made the supply chain especially vulnerable to widespread illness.

The Committee saw a need for stronger cross-departmental leadership, recommending the appointment of a Cabinet-level Minister for Contingency Planning, within whose portfolio pandemic preparedness would fall. Whilst Department of Health leads on this issue, the effects would be felt across Government.

The debate on the report took place on 20 January as *Science in Parliament* was going to press. It will be reported in the Whit issue.

Water Management

Sub-Committee I of the Select Committee is currently conducting an inquiry into Water Management. Chaired by the Earl of Selborne, the inquiry comes at a time of growing pressure upon water resources in the south and east of England, driven primarily by population growth, lifestyle changes and climate change. At the same time, an increasing number of challenging EU Directives on water-related issues are emanating from Brussels, led by the Water Framework Directive.

With the exception of flooding and fluoridation, the inquiry is looking at all significant aspects of water management, including the regulatory system, water resources, demand management, environmental impacts, research and development, consumer issues and the role of the relevant EU Directives. The Committee has received a wide range of written evidence and has already taken oral evidence from the regulators, the industry, government departments and agencies, consumer groups, environmental organisations, farming representatives and academics. In addition, the Committee has visited Yorkshire Water, the 2005 Utility of the Year, and is planning further visits to BedZED and Essex and Suffolk Water. A delegation will also be sent to Australia to examine best practice and new technologies in Melbourne and Sydney.

The Committee will be hearing from the European Commission in February and the relevant Ministers from Defra and ODPM at the end of March. The Chairman intends to publish the report in early summer. For further information please contact the Clerk of the Sub-Committee, Tom Wilson (email wilsont@parliament.uk, telephone 020 7219 6612).

Science and Heritage – new inquiry

An inquiry examining the role of science, engineering and technology in the conservation of the United Kingdom's cultural heritage was launched just before Christmas. Sub-Committee II, chaired by Baroness Sharp of Guildford, will look at both how science and engineering techniques help in the conservation process, and at how technology is used to enhance public understanding of, and access to, cultural objects.

Written evidence has been invited addressing questions set out in the Call for Evidence, which is available from the Select Committee's website. Oral evidence will be heard from March, with the report expected to be published in the summer. For further information please contact the Clerk of the Select Committee, Christopher Johnson (email johnsonc@parliament.uk, telephone 020 7219 6072).

Parliamentary Office of Science and Technology

POST Board – 2005 Parliament

The first meeting of the new POST Board, created after the 2005 general election, occurred on 6th December 2005. At this meeting, Dr Ashok Kumar MP was elected Chair and Professor the Lord Winston, Vice-chair. Other MPs on the POST Board are Michael Connarty, Paul Flynn, Neil Gerrard, Mark Harper, Dr Evan Harris, Anne Snelgrove, Ian Taylor and Dr Desmond Turner. One vacancy remains to be filled by the Conservative whips. The other Lords members of the Board are Lord Broers, Baroness Greenfield and Lord Oxburgh. Non-parliamentary members of the Board remain Professor Fran Balkwill, Professor Sir Tom Blundell, Sir David Davies and Professor Jim Norton.

Recent POST publications

Science in Court

October 2005 ***POSTnote 248***

Science is increasingly used in courts in a variety of ways. Equipment used to gather evidence for the courts may be well-established (for example, breathalysers) or its scientific validity may still be in question (for example, lie detectors). Scientists themselves may act as expert witnesses, presenting evidence. This briefing considers how courts determine what science to accept, the options for accrediting science and expert witnesses and how disagreements between scientists are managed.

Household Energy Efficiency

October 2005 ***POSTnote 249***

Household energy use accounts for more than a quarter of all energy used in the UK but the typical household is only about 66% efficient in the use of that energy. The Government's 2003 Energy White Paper placed energy efficiency centre stage for achieving its energy targets. It identified potential carbon savings amounting to ~20 million tonnes a year (Mt/yr) across the economy over the next 15 years, with 5 Mt/yr coming from the household sector by 2010. Critics question whether current policies will deliver these predicted savings. This POSTnote examines these concerns and explores the barriers to increasing household energy efficiency.

The 24-Hour Society

November 2005 ***POSTnote 250***

In recent years more businesses have begun to operate outside standard working times, contributing to a culture of long or unusual working hours. The "24-hour society" can increase efficiency and help to meet consumer demand but can also have serious health and social impacts. This briefing outlines the driving factors behind the 24-hour society and reviews options to manage its negative impacts, ranging from the European Union (EU) Working Time Directive to new technological solutions.

Sustaining Fisheries

November 2005 ***POSTnote 251***

The fishing industry is an important economic and social activity in parts of the UK; some remote communities are highly dependent upon it. Worldwide, demand for fish is rising but many fish stocks are dwindling with several important stocks threatened in the European Union (EU). A moratorium on fishing of a British favourite, the cod, has been recommended by government scientists since 2001. Several recent inquiries into the sustainability of the fishing industry have concluded that a change in management is required. This briefing outlines the main issues and recent policy developments, with a focus on whitefish stocks.

Recycling Household Waste

December 2005 ***POSTnote 252***

About 29 million tonnes of municipal waste, 87% of which was household waste, was produced in England in 2003/04. Most waste ends up in landfill sites; only 19% of household waste is currently recycled or composted. Recycling is widely assumed to be environmentally beneficial, although the collection, sorting and processing of materials gives rise to some environmental impacts and energy use. This POSTnote summarises the environmental impacts of recycling household waste, and examines some of the reasons why recycling rates are still relatively low.

Cleaner Coal

December 2005 ***POSTnote 253***

Climate change is high on the political agenda, gas and oil prices are increasingly volatile and concerns about nuclear power generation continue. Could "cleaner coal" offer the perfect energy solution? Cleaner coal technologies (particularly those that reduce carbon dioxide (CO_2) emissions) are at various stages of development. Advocates believe they hold the key to a secure and low carbon electricity mix. Critics are concerned that core technologies have not been fully demonstrated and that the barriers to implementation have been underestimated. This POSTnote examines the most prominent technologies and the issues surrounding their use.

Farmland Wildlife

December 2005 ***POSTnote 254***

Farmland covers approximately three quarters of the United Kingdom and has historically provided a wide range of habitats for wildlife. Many British species are adapted to living in a farmed landscape, so efforts to conserve wildlife are often concentrated within managed ecosystems. Much of the wildlife that inhabits farmland has declined over recent decades. The reform of the EU Common Agricultural Policy has presented

an opportunity for farmers to be rewarded for protecting wildlife. This POSTnote examines the current status of wildlife on farms. It reviews the options available to farmers for wildlife conservation and explores the implications of future changes to the countryside.

Current work

POSTnotes are in preparation on:

Biological Sciences and Health - Avian flu, The National DNA database, Healthy life expectancy and Paediatric medicines

Environment and Energy - Ecosystem services, Balancing water supply and the environment, The "embedded" carbon of alternative electricity generation technologies, Siting of nuclear power plants, Decommissioning of nuclear power plants and Carbon offsetting

Physical Sciences, IT and Communications - Military uses of space, Access to Information and Communication Technologies in developing countries, Wireless communications, The analogue-digital switchover, The future of the UK space programme and Pervasive computing

Science Policy, etc - Public engagement in science.

Seminars

In October POST and the British Psychological Society hosted a parliamentary seminar on "Binge Drinking". The seminar was chaired by Prof Pam Maras, of the British Psychological Society. Speakers were Dr Phyllis Starkey MP, chair of POST in the 2001-5 Parliament, Dr Frank Ryan, Consultant Clinical Psychologist, Substance Misuse Service, Hammersmith and Mr Adrian Brown, Alcohol Health Worker, A&E Department, St Mary's NHS Trust.

In November POST and the Engineering and Physical Sciences Research Council hosted a parliamentary seminar on the health and social impacts of the 24-Hour Society. The seminar was chaired by one of POST's new Board members, Anne Snelgrove MP. Speakers included Russell Foster, professor of molecular neuroscience at Imperial College, Melanie Howard, co-founder of the Future Foundation, Simon Quin, Chief Executive of the Association of Town Centre Management, and Leon Kreitzman, author of "the 24 Hour Society".

Fellows and interns at POST

Current and recent fellows are: British Ecological Society Fellow: Nick Worsfold (Sheffield University/Farmland conservation); Economic and Social Research Council Fellow: Cindy Warwick (Oxford University/Water resource management), and Royal Society of Chemistry Fellows: Ruth Croxton (Lincoln University/DNA database) and Greg Offer (Imperial College, London/Future transport technologies).

Since June 2005 POST has also welcomed as interns Nicholas Cockroft (UCL/Conservation science); Marina Roehrs (St Andrews University/Compiling database on overseas parliaments and science and technology); Lydia Cross (Manchester University/The international finance facility for vaccines and other medicines), and Susanne Kadner (University of East Anglia/The Aarhus Convention).

International activities

In September the Director participated in the second international Science and Technology in Society symposium in Kyoto. With colleagues from Shell UK and the Department of Earth Sciences, University of Cambridge, he co-ordinated a session on future energy policies.

Also in September the Director participated in a workshop on parliamentary technology assessment, organised by the Parliamentary Assembly of the Council of Europe, held in Budapest, for the benefit of new and potential member countries of the EU.

In October the Director and Dr Peter Border represented POST at the annual European Parliamentary Technology Assessment network council and conference, held at the Flemish Parliament building in Brussels. At the same time, the Director also spoke on "technological solutions" at an international conference on "Beyond Kyoto" organised at the Solvay Library, Brussels by "Friends of Europe".

Also in October POST hosted a meeting of the group of EPTA members working on a joint study on ICT and Privacy. The interim report was finalised and the next stage of the work programme decided upon.

In November Dr Bella Starling represented POST at a workshop on European bioethics policy, held in Budapest in association with the UNESCO World Science Forum.

The same month Dr Chandrika Nath gave a presentation on "Terrorist attacks on nuclear facilities: assessing and communicating the risk" at a European Commission sponsored conference on Security of Energy Infrastructures, in Brussels.

Also in November the Director spent two days in Tokyo, at the invitation of the Japanese Ministry of Education, Culture, Sports, Science and Technology, as a member of the international assessment panel for projects under its "Super Centres of Excellence" scheme.

Later the same month the Director visited Lisbon to speak at a conference on Politics and Science, held by a new organisation – the Associação Viver a Ciência – set up to promote contacts between the worlds of scientific research and politics in Portugal. He also attended a special meeting of the Comissão de Educação, Ciência e Cultura, of the Assembleia da República – the Portuguese Parliament, to discussion parliamentary science information provision.

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

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

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

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

Oral Evidence

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

Science Question Time
The Committee hosted a "Science Question Time" with Lord Sainsbury of Turville on Wednesday 19 October. The Committee will continue to host such sessions at regular intervals.

Chief Executive of the Natural Environment Research Council: Introductory Hearing
The Committee took evidence from Professor Alan Thorpe, Chief Executive of the Natural Environment Research Council on Wednesday 19 October.

Strategic Science Provision in English Universities: Follow-up session
On Wednesday 2 November, the Committee took evidence from Bill Rammell MP, Minister of State for Lifelong Learning, Further and Higher Education, Department for Education and Skills, and Sir Howard Newby, Chief Executive, Higher Education Funding Council for England. This session was a follow-up to the Committee's Eighth Report of Session 2004-05, *Strategic Science Provision in English Universities* (HC 220) and the Second Special Report of Session 2005-06, *Strategic Science Provision in English Universities: The Government Response to the Committee's Eighth Report of Session 2004-05* (HC 428).

Forensic Science on Trial: Follow-up session
On Wednesday 23 November, the Committee took evidence from the Rt Hon Lord Goldsmith QC, Attorney General and Rt Hon Harriet Harman QC, Minister of State, Department for Constitutional Affairs, and Andy Burnham, Parliamentary Under-Secretary of State, Home Office. This session was a follow-up to the Committee's Seventh Report of Session 2004-05, *Forensic Science on Trial* (HC 96) and the First Special Report of Session 2005-06, *Forensic Science on Trial: The Government Response to the Committee's Seventh Report of Session* 2005-06 (HC 427).

Avian Influenza
On Wednesday 30 November, the Committee took evidence from Professor Colin Blakemore, Chief Executive Officer, Medical Research Council, Dr Alan Hay, Director of the WHO Influenza Reference Centre at the MRC National Institute for Medical Research, Professor Andrew McMichael, Professor of Molecular Medicine, MRC Human Immunology Unit at the University of Oxford and Professor Anne Johnson, Deputy Chairman of the MRC Infections and Immunity Board (IIB), Department of Primary Care and Population Sciences, University College London. This evidence session was intended to ask about the key findings of the MRC's recent visit to south-east Asia and to examine the MRC's contribution to research and development in this area.

Current Inquiries

Carbon Capture and Storage
The Committee announced its terms of reference in July 2005. The inquiry is looking into the viability of CCS as a carbon abatement technology for the UK. Terms of reference include the current state of R&D in CCS technologies, projected timescales for producing market-ready, scalable technologies, cost, geophysical feasibility and the Government's role in funding CCS R&D. In November and December, the Committee held three oral evidence sessions on this inquiry. A Report is expected in February 2006.

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 will focus upon the mechanisms in place for the use of scientific advice (including the social sciences) and the ways in which the guidelines governing the use of such advice are being applied in practice across Government. It will test the extent to which policies are "evidence-based". During the course of the inquiry, the Committee will consider a number of case studies including the technologies supporting the Government's proposals for identity cards, the classification of illegal drugs, and the use of MRI equipment and the EU Physical Agents (Electromagnetic Fields) Directive. The deadline for written evidence was Friday 20 January 2006. The Committee began holding evidence sessions in February 2006.

Research Council Support for Knowledge Transfer
The Committee announced its terms of reference on 1 December 2005. The inquiry will concentrate upon the effectiveness of the Research Councils' knowledge transfer activities. Terms of reference include the promotion of collaborative working between researchers and partners in industry, stakeholder engagement, results and performance management, and co-ordination between the Councils and the role of RCUK. The deadline for written evidence is Thursday 16 February 2006. Oral evidence sessions are likely to begin shortly afterwards.

Further Information

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

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

The Committee has a new website address: www.parliament.uk/s&tcom

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

House of Commons Library Science and Environment Section

Research Papers

The following are summaries of papers produced for Members of Parliament. Information and copies of papers can be obtained from Michael Crawford at the House of Commons Library on 0207 219 6788 or through www.parliament.uk/parliamentary_publications_and_archives/research_papers.cfm

The Health Bill: Part 1 Smokefree premises, places and vehicles

Research Paper 05/79

The Health Bill was presented on 27 October 2005. It had its second reading on 29 November 2005.

This paper informs debate on Part One of the Bill, which seeks to make provision for the prohibition of smoking in certain premises, places and vehicles. The measures will take effect from the summer of 2007 and will apply to England and Wales.

The other provisions of the Health Bill are dealt with in Library Research Paper 05/80.

The Animal Welfare Bill

Research Paper 05/87

The Animal Welfare Bill 2005 was published on 13 October 2005. It had its second reading on 10 January 2006. The Bill seeks to consolidate and modernise animal welfare legislation in England and Wales.

It is an enabling Bill under which a variety of activities and practices involving animals may be regulated.

Progress of Legislation before Parliament

Government Bills

Animal Welfare Bill Bill – 2nd Reading 13.10.05; Committee 17, 19, 24 & 26.1.06

Charities Bill (HL) – 2nd Reading 7.6.05; Committee 28.6.05 & 12.7.05; Report 12 & 18.10.05; 3rd Reading 8.11.05; introduced into the House of Commons 9.11.05

Commons Bill (HL) – 2nd Reading 20.7.05; Committee 25.10. & 1, 9 & 14.11.05; Report 28 & 30.11.05; 3rd Reading 18.1.06; introduced into the House of Commons 19.1.06

Health Bill – 2nd Reading 29.11.05; Committee 6, 8, 13, 15 & 20.12.05 & 10.1.06

Identity Cards Bill – 2nd Reading 28.6.05; Committee 5, 6, 7, 12, 14, 19 & 21.7.05; Report 18.10.05; House of Lords 2nd Reading 31.10.05; Committee 15, 16 & 23.11 & 12, 14 & 19.12.05; Report 16 & 23.1.06

Merchant Shipping (Pollution) Bill (HL) – 2nd Reading 14.6.05; Committee 11.7.05; Report 17.10.05; 3rd Reading 26.10.05; House of Commons 2nd Reading 25.1.06

Natural Environment and Rural Communities Bill – 2nd Reading 6.6.05; Committee 21, 23, 28 & 30.6 & 5.7.05; Report 11.10.05; House of Lords 2nd Reading 7.11.05; Committee 24.1.06

Private Members' Bills

Breast Cancer Bill – introduced under the ballot by Mr Shailesh Vara MP – 2nd Reading debate 20.1.06; to be resumed 3.3.06

Children's Food Bill – introduced under the ballot by Mary Creagh MP – 2nd Reading debate 28.10.05; to be resumed 16.6.06

Climate Change Bill – introduced by Michael Meacher MP – provisional date for 2nd Reading 10.3.06

Climate Change and Sustainable Energy Bill – introduced under the ballot by Mr Mark Lazarowicz MP – 2nd Reading 11.11.05; Committee 25.1.06

Fishery Limits (United Kingdom) Bill (HL) – introduced by Lady Saltoun of Abernethy – 2nd Reading 16.6.05; Committee 5.7.05; 3rd Reading 12.7.05

Food Supplements (European Communities Act 1972 Disapplication) Bill – introduced by Mr William Cash MP – provisional date for 2nd Reading 17.3.06

Management of Energy in Buildings Bill – introduced under the ballot by Dr Alan Whitehead MP – 2nd Reading debate 11.11.05; to be resumed 10.3.06

Pharmaceutical Labelling (Warning of Cognitive Function Impairment) Bill – introduced by Mr Andrew Dismore MP – provisional date for 2nd Reading 12.5.06

Regulation of Laser Eye Surgery Bill – introduced under the ballot by Mr Frank Cook MP – provisional date for 2nd Reading 12.5.06

BOOK REVIEW

Not in our Back Yard

By Anthony Jay

White Ladder Press 2005 ISBN 0-9548219-4-7

The rise of the Rt Hon Jim Hacker from Opposition MP to Prime Minister as recorded by Jonathan Lynn and Anthony Jay in their two books *Yes Minster* and *Yes Prime Minister* gave many of us a new insight into the day-to-day running of our government and of the civil service, and into the way political and administrative decisions are made.

Now Anthony Jay has turned his attention to the planning system and in this book he has undertaken the task of explaining how residents in a local community who are concerned about some new development, such as a proposal to build a wind farm on a local beauty spot, can challenge the authorities and try to stop it happening.

For a small community to take on and fight the local government and big bureaucracies may at first seem a daunting task with little prospect of success but Jay explains that the odds are often better than you would think.

In his preface he says, "Bureaucrats at every level in all organisations are immensely vulnerable in all sorts of ways and to pierce the armour all you need is some insight into their established procedures and mental processes, and a working knowledge of the tactics and techniques that will give you the best chance of victory. It is not actually all that difficult." A particular strength of the book is that Jay has had personal experience of supporting a campaign in his own village in Somerset which was eventually successful. The battle is winnable; it can be done.

This book contains a set of instructions for activists and a working programme for campaign organisers. It explains first how to make the best use of the local skills in the community. This will channel local resentment into an organised movement and mobilise the campaign resources in the most effective way. "You are fighting an enemy with massive resources and vast statutory powers … you must use guerilla tactics."

Jay recommends that a typical campaign should start with an Action Committee supported by a number of specialist groups or cells. These cells have different functions and recognise that different people can contribute different skills.

For instance, a grass roots cell would drum up local support and a funding cell would raise the money. A local lawyer would head up the law cell and a local dignitary would be responsible for finding influential allies. The technical specialists in the experts cell attack the concept, the facts and the figures. They challenge the basic necessity for the project and put forward an alternative. The publicity cell should think up a slogan, a logo and if possible a song. The headquarters cell should ideally include that special skill, the Fixer, with a marvellous gift for "persuading people, for getting unlikely permissions", and for whom "locked doors open, transport appears on demand".

Reading this book does raise the question whether this type of intellectual civil war is really necessary in building and developing our national infrastructure. Is there something wrong with our present planning system which invariably generates local resentment at any new development?

Jay reminds us that most planning decisions are in the hands of local authorities and in making their initial proposals their decision may be often dictated by "what will cause the officials least trouble".

We live on a small overcrowded island but the public's increasing expectations for more and better amenities and for greater personal mobility mean that we need continually to expand our national infrastructure, including building more houses, schools and hospitals, better roads, railways and airports, a better electricity and water supply, and better protection from floods. And at the same time we need to protect our farmland and to provide more unspoilt recreational space. These problems pose political and social challenges.

In proposing new developments should there be better provision for local residents to share the benefits? For instance, would power stations be more acceptable in a local community if local residents were offered cheaper electricity or the provision of district heating? Should residents be offered a choice of alternatives and should financial compensation be more generous and be offered more readily?

This book is essential reading for campaign organisers, but many readers may be left wondering whether it is time to review the operation of the whole planning system. Should we be seeking to create something better?

Robert Freer

LETTER TO THE EDITOR

Sir,

How should we approach the Risks inherent in New Technologies?

The Parliamentary and Scientific Committee asked a very important question at its November Meeting. "Should the Precautionary Principle be replaced by Risk-Related Analysis for Individual New Technologies?" It was surprising to learn from the presentations just how deeply embedded the "precautionary principle" has become not just in EU regulation and legislation, but also even in the US.

We live today in a risk-averse society. The media feed on this and seek to boost their circulation with stories about various disasters around the corner. But why are we so risk averse? The major cause has to be that so many risks faced by our ancestors have been eliminated! We know where the next meal is coming from. We know that we do not face a high probability of our newborn child dying before the age of five. We know that we will be warm through the winter. Life at the basic level has become much more certain and comfortable. We are not accustomed to a significant level of risk taking simply to survive. I take some professional pride in the contribution that technology and its application by engineers have made to this development.

Against this background it is perhaps understandable that society is much more circumspect about change and proposals for even further development. So a cautionary approach is seen as sensible. And the more comfortable and prosperous the society, the more sensible it seems. It is hardly surprising that the most fervent advocates of caution should be the Swedes and the Germans and that they are the inspiration for the Precautionary Principle.

But the major difficulty with the Precautionary Principle is to know quite what it is. There are several different formulations. Reduced to its basics it seems to be a sophisticated version of "better safe than sorry". But of course this only applies if you believe that you are safe. A football team that is four nil ahead on the first leg will play a very cautious defensive game on the second leg. Its opponents on the other hand will need to adopt a quite different strategy. They are not "safe".

And indeed the vast majority of people on the planet are not safe. The poor of Calcutta cannot afford caution if they are to survive. Rich northern countries may be able to afford to ban DDT as a precaution instead of managing its dangers. But for malaria-infested sub-Saharan Africa this is a disaster. And even in our own society we can see lots of threats, deprivation and a need for improvement. We all know that there can be no progress without risk. Everyday expressions reflect this: "No gain without pain"; "You can't make an omelette without breaking eggs". But we do rightly demand that the risk taking, especially that taken by others on our behalf, be managed professionally.

It is this demand that leads us to adopt a formal, structured approach to Risk Assessment and Management. Such an approach seeks to find where the balance of beneficial and harmful risks lie in any proposal. And then, and only then, if the balance seems beneficial it seeks to maximise the potential benefits and to minimise the potential harm. The Royal Academy of Engineering has reported on a framework for this process in respect of engineering and technology developments. In this it is made clear that resources must be allocated to identify potential future hazards inherent in any proposed development. Then steps have to be taken to research and understand the hazard, and/or to mitigate or even side step the hazard. In major projects, independent experts who do not have any vested interest in the outcome of the project should audit this process.

This is not a philosophy of throwing caution to the winds as the Precautionary School might claim. It is recognition that the future is uncertain. There may be unforeseen side effects that cause damage, or even failures to realise the expected benefits. But we have anticipated these possibilities and have outline strategies already in place to handle these eventualities.

John Turnbull
The Royal Academy of Engineering

Debates and Selected Parliamentary Questions & Answers

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

A full digest of all Debates, Questions and Answers on topics of scientific interest from 10th October to 20th December 2005 from both Houses of Parliament appears on pages 46 to 54

Forensic Sciences

Debate in Westminster Hall on Tuesday 18 October

Dr Ian Gibson (Norwich N) referred to the Science and Technology Committee report on "Forensic Science on Trial" of the previous Parliament. The UK has been at the forefront of developments and the Forensic Science Service (FSS), which is an executive agency of the Home Office, is a major player. Other alliances involve the former Laboratory of the Government Chemist, large scientific businesses with an interest in forensic science, and police forces who are contracting out their scientific needs. Universities are also offering forensic science training to police officers, which has led to some criticism. A huge number of techniques are involved in the service, and

we must recognise that it provides information that guarantees that police forces are based on intelligence-led information. Sir Alec Jeffreys, who made the serendipitous discovery that each individual has a different pattern of DNA when it is broken up and run on particular gels, has argued that the whole population should be sampled. Is there any intention to privatise the service, to develop a public-private partnership and to set up a Gov-co?

Dr Brian Iddon (Bolton SE) discussed the McFarland review of the Forensic Science Service published in July 2003, which needs investment to proceed initially as a Gov-co and thereafter as a full public-private partnership. This could jeopardise funding of blue sky research since the Government's objectives appear to be to increase competition and reduce costs. A distinction should be made between specialist scientists trained as chemists, physicists, biologists or zoologists and those trained in forensic science courses that are currently proliferating. Many forensic science graduates enter the police force and it is good for police officers to have an intimate knowledge of forensic science.

The Parliamentary Under-Secretary of State for the Home Department (Fiona Mactaggart) identified December 2005 as the target date for vesting as a Gov-co, at arm's length from the Home Office. The national DNA database, which is a national criminal justice asset, a world leader and one of the UK's key intelligence databases, will not be transferred to the Gov-co and the public-private partnership. It will be retained under strong central control initially in the Home Office, overseen by a tripartite board composed of the Home Office, Association of Chief Police Officers, the Association of Police Authorities with representatives from the Human Genetics Commission. The operational delivery of database services will continue to be provided by the FSS in the first instance to ensure continuity of service to the police. Wider consultation will take place about the most effective long-term oversight of the national DNA database and other national forensic databases. The Home Office has close links with the Engineering and Physical Sciences Research Council and meets other research councils to improve links to the research community, thus enabling some blue sky horizon scanning, although it is admitted that research is very limited at present with only 2 per cent of FSS turnover going to R&D. However, commerical imperatives will create pressure to increase blue sky research in future .

Science and Technology

Debate in House of Lords on Thursday 3 November

Lord Bhattacharyya rose to call attention to the contribution of science, engineering and technology to the United Kingdom economy. It was Lord Waldegrave in the Conservative Government who gave us our current strategy in the White Paper, Realising our Potential, launched in 1993. Its purpose was "To harness the strength of science and engineering to the creation of wealth in the UK by bringing it into closer, more systematic contact with those responsible for industrial and commercial decisions". However, there is a key difference between then and now – and that is that this government have been prepared to put some cash behind the policy so that it can be implemented. The fruits of some of this new spend are demonstrated by the Diamond x-ray research facility, jointly funded by the Government and the Wellcome Trust, near Oxford. At a capital cost of £380 million, it is the largest research facility to be built in the UK for more than 30 years. It will make a major impact in the fields of molecular biology and genetics, just as the Sanger Institute played a remarkable role in the human genome project, which is now leading to new technologies, supported by the UK's enlightened position on regulatory controls. The UK is thus well placed to build on the genetic revolution leading to profitable products for sale.

New centres of world-class research in Asia are growing fast. China alone graduates in excess of 600,000 scientists and engineers every year. But let us not forget that the modern mobile phone, which we use every day, comes entirely out of Britain and the largest mobile phone company – Vodafone – is in this country, even though the phones themselves may be manufactured in the Far East.

Lord Soulsby of Swaffham Prior asked the question whether Britain's science and technology is well enough placed to advance the economy of this country. Three questions must be answered. First, does the national income spend on research and development compare with that of competitor countries? Secondly, do we adequately recognise our R&D personnel, and thirdly how does UK research and development impact on the global village?

Lord May of Oxford pointed out that Joe Stiglitz's report from his Council of Economic Advisers to President Clinton in 1995 showed that investments in research and development (R&D) have large payoffs in terms of growth. Indeed investments in R&D are estimated to account for half or more of the increase in output per person. Hence you now have to add new knowledge to both labour and capital as it accounts for as much as half of the productivity growth.

Lord Turnberg estimated that of the total of £5.5 billion of investment from a variety of sources in medical research in the UK, the UK probably gains £5 for every pound invested in such medical research.

The Parliamentary Under-Secretary of State, Department of Trade and Industry (Lord Sainsbury of Turville) emphasised the importance of this country as a place where talented entrepreneurs and world-class companies can congregate from around the world, perform their research aided by strong university links and develop and finance their business in an environment with a high quality of life.

UK Space Policy

Debate in Westminster Hall on Wednesday 23 November

Mr Bill Olner (Nuneaton) declared an interest as the joint chair of the all-party group on space, which has the support of nearly 100 Members, from both Houses

and both sides of this House. The relevance of space is growing in an information age using television, mobile phones, weather forecasting and satellite navigation based on space technology. Space applications monitor disasters and climate change, and help with the distribution of aid. The UK's lead role in the space revolution, which arises from sustained development and investment in technology, is acknowledged here. The Inmarsat-4 satellite series was made in Britain by EADS Astrium and operated in Britain by Inmarsat, the world's most profitable mobile satellite communications company. This is a triumph for British technology and business and a strategic asset that is highly regarded by many countries. However Britain only spends £195 million a year on civil space activities, a penny per person per day, with a spending level which is only 16th in the world. If we are to remain a world leader and a sharp cutter at the edge of this technology, we need more investment.

The Minister for Energy (Malcolm Wicks): This is an opportunity to consider the UK's role in space and applaud the work of the All-Party Parliamentary Space Committee. Our national priorities are firstly to maintain high-quality science; secondly to stimulate commercial use of space leading to downstream economic benefits; and thirdly to identify and support projects such as Galileo that benefit the lives of citizens in the UK. This is a key part of the infrastructure that is necessary for a digital world. The UK has contributed more than 17 per cent of the cost of the early phase of Galileo and also contributes through the EU budgets. Decisions on funding for the next phase have not been taken yet and discussion could proceed well into 2006. Global Monitoring for Environment and Security (GMES) is well known to the DTI and across government where it has demonstrated practical services especially in the aftermath of the Boxing Day tsunami. Spending on space is sound investment in an exciting sector. Government seeks to support technology development for the space industry and has provided almost £200 million in 2004-05, and the return on our investment exceeds that of many of our counterparts.

Telecommunications Masts

Question and Written Answer on Thursday 8 December

Lynne Featherstone (Hornsey & Wood Green): To ask the Deputy Prime Minister pursuant to the answer of 28 November 2005 on mobile telephone masts, if he will make a statement on the application of the precautionary principle as recommended by the Stewart Group and adopted by the Government.

Yvette Cooper: Since the publication of the Stewart Report the Government has introduced standards to ensure that all base stations meet the international guidelines on public exposure set by the International Commission on Non-Ionising Radiation Protection (ICNIRP). These guidelines are five times tougher in respect of public exposure than the guidelines previously used. More generally the Government's acceptance of the precautionary approach recommended by the Stewart Group is demonstrated in the way it has adopted its recommendations.

Low-carbon Vehicles

Question and Written Answer on Tuesday 13 December

Mr Hollobone (Kettering): To ask the Secretary of State for Transport what steps have been taken under the UK's EU Presidency to encourage vehicle manufacturers to speed up the development of low carbon vehicles.

Dr Ladyman: The UK Government has made climate change one of the main priorities of its EU and G8 presidencies this year, and has sought wherever possible to highlight the importance of improving the fuel efficiency of vehicles as a way of reducing emissions of carbon dioxide from the transport sector. The communique that was agreed at the G8 Gleneagles summit on 8 July, for example, included a climate change, clean energy and sustainable development action plan. This contained a commitment to a package of measures to encourage the development and uptake of clean, low carbon vehicles. A copy of the full communique text is available at http://www.g8.gov.uk.

The UK also hosted an international Environmentally Friendly Vehicles (EFV) conference on 10–11 November 2005, providing a forum for global dialogue on the promotion and uptake of cleaner, more fuel efficient vehicles. Over 250 delegates from more than 30 countries attended, and the chairman's conclusions, together with copies of the presentations and other supporting material, are available at http://www.livegroup.co.uk/efvc.

The UK has also been actively involved in the European CARS 21 initiative this year. This has considered ways to encourage further development of low carbon vehicles as part of an integrated approach towards reducing CO_2 emissions in the transport sector.

Within the UK, we have continued to incentivise the development and uptake of clean, fuel efficient vehicles as set out in our 2002 Powering Future Vehicles Strategy, which is available via the Department for Transport's website. We also launched during 2005 a new system of colour-coded fuel efficiency labels for cars to raise consumer awareness and help boost demand for fuel efficient vehicles. The labels are now in the majority of new car showrooms in the UK.

Fuel Cell Technology

Question and Written Answer on Wednesday 14 December

Mr Yeo (S Suffolk): To ask the Secretary of State for Trade and Industry what support his Department gives to the (a) development of fuel cell technology and (b) application of such technology to the transport sector.

Malcolm Wicks: DTI provides support for industrial collaborative research and development for fuel cells through the DTI Technology programme. The programme seeks to advance fuel cell technology for both stationary power generation and transport

applications, with a view to achieving the cost reductions and performance levels necessary for commercial deployment.

Basic research in universities on both fuel cells and hydrogen is supported by the Engineering and Physical Sciences Research Council (EPSRC), including through the SUPERGEN initiative. The Government also provided funding of over £450,000 for the trial of three hydrogen-powered fuel cell buses in London as part of the CUTE project. £7.5 million of funding has been provided for the fuel cell and low carbon vehicle technology Centre of Excellence (CENEX) based in Loughborough.

On 14 June 2005, the Government announced a funding package worth £15 million for hydrogen and fuel cell demonstration projects. This scheme is currently in preparation, and will require EC state aids approval.

Stem Cell Research

Question and Written Answer on Wednesday 14 December

Mr Amess (Southend W): To ask the Secretary of State for Health how many diseases were cured as a result of (a) adult and (b) embryonic stem cell research in each year since 2002; and if she will make a statement.

Jane Kennedy: Research with embryonic stem cells has been licensed to allow scientists to understand and develop treatments for conditions such as motor neurone disease, diabetes and cystic fibrosis. It is still too early to speak of cures, but scientific and medical opinion is that stem cell research will revolutionise medicine in the 21st century.

There has been a number of encouraging early stage clinical trials with adult embryonic stem cells. As a result of the United Kingdom stem cell initiative, the Government are investing £100 million in stem cell research and clinical trials over the next two years.

Scientific Publications: Free for all?

Debate in Westminster Hall on Thursday 15 December

Mr Phil Willis (Harrogate and Knaresborough) welcomed the opportunity to debate the Science and Technology Committee's 10th report of session 2003-04, "Scientific Publications: Free for all?" The market for scientific journals did not feature in his postbag or radar before he became Chairman of the Committee, but in the last six months this is the one that has generated the most interest and intense feeling as it divides both the academic and publishing communities with Ministers running for cover. The task is to put the issue of scientific publications into context.

Dr Ian Gibson (Norwich N) pointed out that the Committee had considered all the problems and were saying "Come on, get together, and start to address those problems, and do something about them." There has been a move in the right direction but not enough of one. The attitude that there is no problem was not reflected in the report: there is a problem. His final word to the Government is "Come on, get off your knees. If you believe in science, support some of the ideas in this report."

Mr Edward Vaizey (Wantage) made the case for constituencies in Oxfordshire where scientific publishing is a huge industry, including Reed Elsevier, Blackwell, Macmillan, Oxford University Press, Informa and CABI together providing employment for some 5,000 people directly and indirectly and generating some £100 million in revenues from overseas, representing a world-beating industry. He disagreed with the conclusions of the report which had been pushed forward too fast without proper analysis and discussion of the additional problems they may bring with them and did not accept that the problem lay with the publishers.

The Parliamentary Under-Secretary of State for Trade and Industry (Barry Gardiner) indicated that the Government's position on open access is that research funding authorities should have the discretion to provide the funds if the author prefers an open access route. The aim is to allow the market to develop, without institutional barriers being put in the way of any particular publishing model, and they are happy to see publishers developing several business models, including subscriber pays, open access, and hybrid approaches. That option will encourage competition and innovation in the publishing industry and in publishing models, as well as retaining freedom of choice for authors. This approach is in the long-term interest of a sustainable scientific publications market.

Parliamentary & Scientific Committee News

New Members

We are pleased to welcome the following new members:

Parliamentary Members

Ms Margaret Moran MP

Mr Brooks Newmark MP

Mr Phil Willis MP

Scientific and Technical Organisations

John Innes Centre, represented by Dr Dee Rawsthorne

The Royal Commission on Environmental Pollution, represented by Mr Tom Eddy

Industrial Member

Oxford Computer Consultants Ltd, represented by Dr Reynold Greenlaw

UK Parliament - Digest of Parliamentary Debates, Questions and Answers 10th October – 20th December 2005

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 42 to 45.*

Agriculture

Animal and Plant Diseases – 31.10.05 HoC 675W
Damson Trees – 20.12.05 HoC 2665W
Fireblight Disease – 7.11.05 HoC 23W
Flower Imports – 22.11.05 HoC 1842W
Food Security – 14.11.05 HoL WA118 & 22.11.05 HoC 1843W
Orchards – 17.11.05 HoC 1377W

Animal Experiments

Animal Experimentation – 24.10.05 HoC 36W, 28.11.05 HoC 24W & 8.12.05 HoC 1523W
Animal Procedures Committee – 10.11.05 HoC 25WS & HoL WS61, 14.12.05 HoC 153WS & HoL WS121
  Annual Report 2004 – 20.10.05 HoC 62WS & HoL WS59
Animal Rights Extremists – 2.11.05 HoC 1098W
Animal (Scientific Procedures) Inspectorate – 21.11.05 HoC 95WS & HoL WS109
Animal Testing (Attacks) – 23.11.05 HoC 2144W
  Cosmetics – 18.10.05 HoC 909W
Animal Welfare – 18.10.05 HoC 863W
Animals (Scientific Procedures) Act 1986: Annual Report – 8.12.05 HoLWS89
Botulinum Toxin – 14.12.05 HoC 2007W
Europe Goes Alternative Conference – 7.11.05 HoC 66W
Primates – 9.11.05 HoC 542W
Scientific Procedures Statistics (Living Animals) 2004 – 8.12.05 HoC 117WS

Animal Health and Welfare

Animal Diseases (Africa) – 5.10.05 HoC 2802W
  Health – 8.11.05 HoC 292W
  Husbandry – 17.10.05 HoC 663W
  Quarantine – 14.11.05 HoL WA115
  TB – 19.12.05 HoC 2372W
  Welfare Bill – 5.12.05 HoC 920W
Avian Flu – 13.10.05 HoL 408, 26.10.05 HoL 1203, 1.11.05 HoL WS9, 7.11.05 HoL WA54, 9.11.05 HoL WA76, 14.11.05 HoL WA115, 7.12.05 HoL WA100, 13.12.05 HoL WA146, 15.12.05 HoL WA177
  Debate – 17.11.05 HoL 1280
  Wild Bird Imports – 10.11.05 HoL WA89
Avian Influenza – 14.10.05 HoC 37WS, 17.10.05 HoC 665W, 19.10.05 HoC 1017W, 20.10.05 HoC 967 & 1128W, 21.10.05 HoC 1269W, 24.10.05 HoC 85W, 26.10.05 HoC 307, 31.10.05 HoC 23WS & 677W, 1.11.05 HoC 874W & 1006W, 2.11.05 HoC 1043W & 1219W, 3.11.05 HoC 1269W, 7.11.05 HoC 6W, 8.11.05 HoC 315W, 9.11.05 HoC 476W, 10.11.05 HoC 669W, 11.11.05 HoC 831W, 14.11.05 HoC 873W, 15.11.05 HoC 1048W, 17.11.05 HoC 1090, 21.11.05 HoC 1523W, 28.11.05 HoC 4W, 1.12.05 HoC 35WS & 649W, 5.12.05 HoC 920W, 6.12.05 HoC 1085W, 12.12.05 HoC 1585W & 14.12.05 HoC 2005W
  Epidemiology Report – 15.11.05 HoC 48WS
Avian Quarantine – 15.12.05 HoC 166WS
Aviculture – adjournment debate – 8.11.05 HoC 49WH
Beef – 5.12.05 HoC 924W
Beef Imports – 31.10.05 HoC 678W
Bee Keeping/Research – 17.11.05 HoC 1365W
Bees – 20.10.05 HoC 970, 21.11.05 HoC 1525W, 29.11.05 HoC 303W, 30.11.05 HoC 503W & 6.12.05 HoC 1085W
Biosecurity – 31.10.05 HoC 678W & 7.11.05 HoC 12W
Bird Imports (Border Procedures) – 28.11.05 HoC 9W
  Markets – 11.11.05 HoC 833W
  Trade – 3.11.05 HoC 1275W, 8.11.05 HoC 317W & 9.11.05 HoC 478W
Birds – 1.11.05 HoC 1007W, 2.11.05 HoC 1044W, 7.11.05 HoC 13W, 21.11.05 HoC 1526W & 1.12.05 HoC 649W
Brazilian Meat – 8.11.05 HoC 318W, 10.11.05 HoC 670W & 28.11.05 HoC 10W
Caseous Lymphadentis – 10.11.05 HoC 671W
Cattle Imports (Brazil) – 2.11.05 HoC 1046W
Clade – 7.11.05 HoC 16W
Duck Producers – 7.11.05 HoC 23W
Endangered Species – illegal imports – 17.11.05 HoC 1374W
EU: Live Bird Imports – 10.11.05 HoL WA91 & 30.11.05 HoL WA35
Exotic Birds – 14.11.05 HoL WA118, 17.11.05 HoC 1085 & 29.11.05 HoL WA19
  Wild Birds – 1.11.05 HoC 882W
Foot and Mouth – 19.10.05 HoC 1021W, 31.10.05 HoC 685W & 12.12.05 HoC 1598W
  Brazil – 19.10.05 HoC 1022W & 5.12.05 HoC 930W
Game Birds – 31.10.05 HoC 687W
Government Veterinary Service – 31.10.05 HoC 820W
Legal Meat Imports – 31.10.05 HoC 689W
Liver Fluke – 10.11.05 HoC 678W
Marsh Report – 17.10.05 HoC 669W
Meat Imports – 15.11.05 HoC 1065W
National Register of Poultry Businesses – 5.12.05 HoC 932W
Newcastle Disease – 19.10.05 HoC 1024W
Pigeons – 15.11.05 HoC 1067W & 28.11.05 HoC 18W
Poultry – 15.12.05 HoC 2210W & 19.12.05 HoC 2386W
  And Captive Bird Import Restrictions – 20.12.05 HoL WA277
  Cull (Avian Influenza) – 9.11.05 HoC 536W
  Farms – 14.11.05 HoL WA125
  Numbers – 8.11.05 HoC 324W

Aviation

Biological and Chemical Weapons

Biodiversity and Conservation

Biotechnology

BSE and CJD

Bovine Tuberculosis

Chemicals and Pesticides

Climate Change

Construction

Crime

Defence

Defence (Gulf War)

Education

Energy

Energy (Coal)

Energy (Nuclear)

Energy (Renewable)

Environment (Pollution)

Environment (Protection)

EU Meetings

Fisheries

Food and Nutrition

Health (Cancer)

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Euro-News

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

Commission outlines integrated strategy

The Commission adopted a new action plan on 12 October, setting out for the first time a fully integrated approach to EU research and innovation policies, in line with the updated Lisbon partnership for growth and jobs. This plan proposes opening a dialogue to identify regulatory barriers to research and innovation. The plan outlined what we should be doing at EU and Member State level and how best to monitor these activities. Investing in knowledge is the best way for Europe to be competitive on the global stage and maintain its quality of life.

The President's initiatives

The EU Council President Tony Blair calls for R&D and Innovation to be co-ordinated by a European Research Council (ERC) similar to the National Science Foundation in the US. This should help the EU to become a world leader in biotechnology for example. Europe's universities are also called upon to address the need for increased competitiveness especially with the US, public-private partnerships and graduate schools. Energy is also a priority where a common energy policy is needed to replace the haphazard way energy priorities are determined nationally. Sustainable energy from nuclear power is not popular with some MEPs however.

Communicating science

Wolfgang Heckl is a leading scientist, and winner of the Descartes Prize, whose efforts to communicate his work to a wider audience have made him a household name in Germany and elsewhere. He states that the ultimate goal of science communicators should be to contribute to a democratic society and the creation of responsible citizens.

European Research Council (ERC)

The ERC should work on the basis of minimum bureaucracy and maximum trust. It will fund research across all fields following a peer review process of the highest standard. The Commission's proposals for FP7, which initiated the idea of the ERC have not been approved yet by Council. However the Scientific Council believes that they will be in a position to develop a carefully planned strategy to facilitate a rapid start-up.

EU maritime research

EU maritime policy must be underpinned by research according to Joe Borg the EU Commissioner for Fisheries and Maritime Affairs. He invited the marine research community to take up the challenges that lie ahead by contributing to the Green Paper for an EU maritime policy and in ensuring maximum benefit is derived from the Seventh Framework Programme.

A roadmap for nanotechnology applications

The NanoRoadMap (NRM) project concentrates on materials, health and medical services applications and ended in December 2005. The results were presented at an international conference in Cologne, "NanoSolution 2005".

Vaccine for H7N1 strain of avian flu developed

Six partners working together in an EU-funded project have developed a vaccine for the H7N1 strain of avian influenza. The vaccine will be tested in clinical trials in spring 2006. The H7 virus can pass from poultry to humans and caused lethal outbreaks in Italian poultry in 1999 and was linked to the H7N7 poultry virus outbreak in the Netherlands in 2003 where over 80 people were infected and one died.

NESTA funding approved

The European Commission has approved the UK's NESTA invention and innovation programme, a €35.3 million risk capital fund that supports newly created innovative micro and small-sized enterprises (MSE's) in the UK.

No "brain drain" from the UK

A new report from the Higher Education Policy Institute in the UK has concluded that there is no "brain drain" from the UK. The UK benefits from a substantial net immigration of academics. Researchers from European countries are beginning to treat the UK as UK researchers regard the US, coming here to begin their careers and establish their reputations, and then returning to their home countries to continue their careers.

CaSE favours commercial research at universities

Although the Campaign for Science and Engineering in the UK (CaSE) considers that commercial research is both desirable and essential, the practice of government funding schemes that are only unlocked when universities raise "matching funds" are generally only available where an industrial company has enough interest to spend large sums of its own money, thus restricting money spent on "blue-sky" research. This is harmful to the economy in the long term as it is fundamental research that generates new ideas. The European Research Council will therefore concentrate specifically on funding basic research.

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

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

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

Physiology
University of Leeds

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

Psychology
British Psychological Society
University of Leeds

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

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

Quality Management
Campden & Chorleywood Food Research Association
LGC

Radiation Hazards
Cefas
HPA Radiation Protection Division

Retail
Marks and Spencer

Satellite Engineering
University of Surrey

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

Seed Protection
CABI Bioscience

Sensors and Transducers
AMSI
CCLRC

SSSIs
English Nature
Royal Botanic Gardens Kew

Statistics
Royal Statistical Society

Surface Science
CCLRC

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

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

Tropical Medicine
Society for General Microbiology

Viruses
ABPI
Society for General Microbiology

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

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

Association of the British Pharmaceutical Industry

Contact: Dr Philip Wright
12 Whitehall, London SW1A 2DY
Tel: 020 7747 1408
Fax: 020 7747 1417
E-mail: pwright@abpi.org.uk
Website: www.abpi.org.uk

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

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

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

Association of Marine Scientific Industries

Contact: John Southerden, Director
Association of Marine Scientific Industries
4th Floor, 30 Great Guildford Street
London SE1 0HS
Tel: 020 7928 9199 Fax: 020 7928 6599
E-mail: amsi@maritimeindustries.org
Website: www.maritimeindustries.org

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

Academy of Medical Sciences

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

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

AIRTO

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

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

Biotechnology and Biological Sciences Research Council

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

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

British Association for the Advancement of Science - the BA

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

The BA is the UK's nationwide, open membership organisation dedicated to connecting people with science, so that science and its applications become accessible to all. The BA aims to promote openness about science in society and to engage and inspire people directly with science and technology and their implications.

Established in 1831, the BA organises major initiatives across the UK, including the annual BA Festival of Science, National Science Week, programmes of regional and local events, and an extensive programme for young people in schools and colleges.

British Ecological Society

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

The British Ecological Society promotes the science of ecology worldwide. The Society has 4,000 members who are active in advancing the science and application of ecology.

The BES publishes four internationally renowned scientific journals and organises the largest scientific meeting for ecologists in Europe. The BES also supports ecologists in developing countries and fieldwork in schools through its grants.

The BES informs and advises Parliament and Government on ecological issues and welcomes requests for assistance from parliamentarians.

BRITISH PHARMACOLOGICAL SOCIETY

Today's science, tomorrow's medicines

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

The British Pharmacological Society has now been supporting pharmacology and pharmacologists for 75 years. Our 2,400 members, from academia, industry and clinical practice, are trained to study drug action from the laboratory bench to the patient's bedside. Our aim is to improve the quality of life by developing new medicines to treat and prevent the diseases and conditions that affect millions of people and animals. Inquiries about drugs and how they work are welcome.

The British Psychological Society

Contact: Dr Ana Padilla
Parliamentary Officer
The British Psychological Society
33 John Street
London WC1N 2AT
Tel: 020 7692 3412
Fax: 020 7419 6922
Email: anapad@bps.org.uk
Website: www.bps.org.uk

The British Psychological Society is an organisation of over 34,000 members governed by Royal Charter. It maintains the Register of Chartered Psychologists, publishes books, 10 primary science Journals and organises conferences. Requests for information about psychology and psychologists from parliamentarians are welcome.

British Society for Antimicrobial Chemotherapy

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

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

British Veterinary Association

Contact:Chrissie Nicholls
7 Mansfield Street, London W1G 9NQ
Tel: 020 7636 6541
Fax: 020 7637 4769
E-mail:chrissien@bva.co.uk
www.bva.co.uk

BVA's chief interests are:

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

BVA carries out three main functions which are:

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

CABI Bioscience

Contact: Dr Joan Kelley, Director, UK
CABI Bioscience, Bakeham Lane,
Egham, Surrey TW20 9TY.
Tel: 01491 829080 Fax: 01491 829100
E-mail: bioscience.egham@cabi.org
Website: www.cabi-bioscience.org

CABI *Bioscience* is a new breed of international organisation specialising in sustainable agriculture, the conservation of biodiversity and invasive species management. Globally the work of CABI Bioscience focuses on the farmer and his need to adapt and respond to the changes and challenges of the markets – these may be for organic produce or dealing with the effects of climate change or alien invasive species in a safe and sustainable way.

CABI *Bioscience* UK is one of a network of 6 global CABI *Bioscience* centres and a division of CAB International, a not-for-profit, UN treaty-level organisation. Its sister enterprise is CABI *Publishing*, a leading international life science publisher.

Campden & Chorleywood Food Research Association

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

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

Cavendish Laboratory

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

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

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

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

High Energy Physics: LEP, SPS & future LHC experiments. Detector development. Particle physics theory.

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

Cefas

Centre for Environment, Fisheries & Aquaculture Science

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

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

Chartered Institute of Patent Agents

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

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

Clifton Scientific Trust

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

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

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

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

Clifton Scientific Trust Ltd is registered charity 1086933

Council for the Central Laboratory of the Research Councils

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

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

University of East Anglia

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

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

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

Economic and Social Research Council

Contact: Lesley Lilley, Senior Policy Manager, Knowledge Transfer,
Economic and Social Research Council,
Polaris House, North Star Avenue,
Swindon SN2 1UJ
Tel: 01793 413033 Fax 01793 413130
lesley.lilley@esrc.ac.uk
http://www.esrc.ac.uk

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

Engineering and Physical Sciences Research Council

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

EPSRC invests more than £500 million a year in research and postgraduate training in the physical sciences and engineering, to help the nation handle the next generation of technological change. The areas covered range from mathematics to materials science, and information technology to structural engineering.
We also actively promote public engagement with science and engineering, and we collaborate with a wide range of organisations in this area.

English Nature

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

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

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

Environment Agency

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

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

Freshwater Biological Association

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

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

Health Protection Agency

Radiation Protection Division (formerly NRPB)

Contact: Dr Michael Clark
Radiation Protection Division Scientific Spokesperson
Chilton, Didcot, Oxon OX11 0RQ
Tel:01235 822737 Fax: 01235 822746
Email: pressoffice@hpa-rp.org.uk
Website: www.hpa.org.uk/radiation

The Radiation Protection Division was formed on 1 April 2005 when the National Radiological Protection Board merged with the Health Protection Agency, under the provisions of the Health Protection Agency Act 2004.

As part of the Centre for Radiation, Chemical and Environmental Hazards, the Division carries out the Agency's work on ionising and non-ionising radiations. It undertakes research to advance knowledge about protection of people from the risks of these radiations; provides laboratory and technical services; runs training courses; provides expertinformation and has a significant advisory role in the UK.

Human Fertilisation and Embryology Authority

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

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

Institute of Biology

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

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

The Institute of Mathematics and its Applications

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

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

Institute *of* Physics

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

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

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

Institute of Physics and Engineering in Medicine

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

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

IChemE

Institution of Chemical Engineers

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

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

Institution of Civil Engineers

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

ICE aims to be a leader in shaping the engineering profession. With over 75,000 members, ICE acts as a knowledge exchange for all aspects of civil engineering. As a Learned Society, the Institution provides expertise, in the form of reports and comment, on a wide range of subjects from energy generation and supply, to sustainability and the environment.

LGC

Queens Road, Teddington
Middlesex, TW11 0LY
Tel: +44 (0)20 8943 7000
Fax: +44 (0)20 8943 2767
E-mail: info@lgc.co.uk
Website: www.lgc.co.uk

Setting standards in analytical science

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

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

LGC is based in Teddington, Middlesex, with other UK operations in Runcorn, Edinburgh, Culham, Risley and Tamworth and facilities in France, Germany, Italy, Poland, Spain, Sweden and India.

University of Leeds

Contact: Dr W E Lewis,
Director of Research Support Unit
Research Support Unit, 3 Cavendish Road,
Leeds LS2 9JT
Tel: 0113 3436028
Fax: 0113 3434058
E-mail: w.e.lewis@adm.leeds.ac.uk
Website: http://www.leeds.ac.uk/rsu

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

London Metropolitan Polymer Centre

Contact: Alison Green,
London Metropolitan University
166-220 Holloway Road, London N7 8DB
Tel: 020 7133 2189
Fax: 020 7133 2184
E-mail: alison@polymers.org.uk
Website: www.polymers.org.uk

The London Metropolitan Polymer Centre provides training, consultancy and applied research to the UK polymer (plastics & rubber) industry. The training courses are delivered through a programme of industrial short courses and customised courses and these, together with distance learning and other flexible delivery methods, lead to qualifications ranging from technician to Masters level. Recent successes include a WRAP sponsored programme to develop new commercial applications for recycled PET and several technology transfer projects with companies.

Marks & Spencer Plc

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

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

Main Business Activities

Retailer - Clothing, Food, Financial Services and Home.
Over 400 stores in 30 countries worldwide. Employing 65,000 people.

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

Medical Research Council

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

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

Merck Sharp & Dohme Research Laboratories

Contact: Dr Ray Hill
Licensing and External Research, Europe
Terlings Park
Eastwick Road
Harlow
Essex CM20 2QR.

Tel: 01279 440167
Fax: 01279 440713
E-mail: ray_hill@merck.com
www.merck.com

Drug discovery for brain diseases.

The National Endowment for Science, Technology and the Arts

Contact: Tangiwai Baker
Policy & Public Affairs Assistant
Fishmongers' Chambers
110 Upper Thames Street, London EC4R 3TW
Tel: 020 7645 9500
Fax: 020 7645 9501
Email: tangiwai.baker@nesta.org.uk
Website: www.nesta.org.uk

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

National Physical Laboratory

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

The National Physical Laboratory (NPL) is the United Kingdom's national standards laboratory, an internationally respected and independent centre of excellence in research, development and knowledge transfer in measurement and materials science. For more than a century, NPL has developed and maintained the nation's primary measurement standards - the heart of an infrastructure designed to ensure accuracy, consistency and innovation in physical measurement.

Natural Environment Research Council

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

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

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

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

University of Newcastle upon Tyne

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

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

The Nutrition Society

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

Founded in 1941, The Nutrition Society is the premier scientific and professional body dedicated to advance the scientific study of nutrition and its application to the maintenance of human and animal health.
Highly regarded by the scientific community, the Society is the largest learned society for nutrition in Europe. Membership is worldwide and is open to those with a genuine interest in the science of human or animal nutrition.
Principal activities include:
1. Publishing internationally renowned scientific learned journals
2. Promoting the education and training of nutritionists
3. Promoting the highest standards of professional competence and practice in nutrition
4. Disseminating scientific information through its publications and programme of scientific meetings

Particle Physics and Astronomy Research Council

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

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

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

Prospect

Contact: Sue Ferns,
Prospect Head of Research and Specialist Services, Prospect House
75 – 79 York Rd, London SE1 7AQ
Tel: 020 7902 6639 Fax: 020 7902 6637
E-mail: sue.ferns@prospect.org.uk
www.prospect.org.uk

Prospect is an independent, thriving and forward-looking trade union with 104,000 members. We represent scientists, technologists and other professions in the civil service, research councils and private sector.

Prospect's collective voice champions the interests of the engineering and scientific community to key opinion-formers and policy makers and, with negotiating rights with over 300 employers, we seek to secure a better life at work by putting members' pay, conditions and careers first.

The Royal Academy of Engineering

Contact: Tom McLaughlan,
Director of Communications
29 Great Peter Street,
London SW1P 3LW
Tel: 020 7227 0500 Fax: 020 7233 0054
E-mail: tom.mclaughlan@raeng.org.uk
Website: www.raeng.org.uk

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

KEW GARDENS

PLANTS PEOPLE POSSIBILITIES

ROYAL BOTANIC GARDENS KEW WORLD HERITAGE SITE

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

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

SAVING THE WORLD'S PLANTS FOR LIFE

The Royal Institution

The Royal Institution of Great Britain

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

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

The Royal Society

THE ROYAL SOCIETY

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

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

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

The Royal Society of Chemistry

RS•C ROYAL SOCIETY OF CHEMISTRY

Contact: Dr Stephen Benn
Parliamentary Affairs
The Royal Society of Chemistry
Burlington House, Piccadilly, London W1J 0BA
Tel: 020 7437 8656 Fax: 020 7734 1227
E-Mail: benns@rsc.org
Website: http://www.rsc.org
http://www.chemsoc.org

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

The Royal Statistical Society

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

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

The Science Council

the SCIENCE council

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

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

SEMTA

Technology Skills for Productivity & Performance

Contact: Dr Bernard Capaldi
Director of Industry Products and Services
SEMTA, Wynyard Park House,
Wynyard Park, Billingham, TS22 5TB
Tel: 01740 627000 Fax: 01740 644799
Email: bcapaldi@semta.org.uk
Website: www.semta.org.uk

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

Our **Mission** is 'to ensure that our sector has the knowledge and skills required to meet the challenges faced by the workforce of the future.'

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

Society for General Microbiology

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

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

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

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

Society of Chemical Industry

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

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

Society of Cosmetic Scientists

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

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

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

University of Surrey

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

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

Universities Federation for Animal Welfare

Contact: Dr James Kirkwood,
Scientific Director
The Old School, Brewhouse Hill
Wheathampstead, Herts. AL4 8AN.
Tel: 01582 831818. Fax: 01582 831414.
Email: ufaw@ufaw.org.uk
Website: www.ufaw.org.uk
Registered Charity No: 207996

UFAW is an internationally-recognized independent scientific and educational animal welfare charity. It works to improve animal lives by:

- supporting animal welfare research.
- educating and raising awareness of welfare issues in the UK and overseas.
- producing the leading journal Animal Welfare and other high-quality publications on animal care and welfare.
- providing expert advice to government departments and other concerned bodies.

Science Diary

The Parliamentary and Scientific Committee

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

Wednesday 1 March
Annual Lunch
Speaker: The Lord Rees of Ludlow PRS
Savoy Hotel

Tuesday 14 March 10.00-14.00
Science and Society
Science Week Seminar
One Birdcage Walk, SW1H 9JJ

Monday 24 April 17.30
Discussion Meeting
Subject to be confirmed

Monday 22 May 17.30
AGM and Discussion Meeting
Subject to be confirmed

The Royal Institution

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

Friday 3 March 20.00
Motor neurone disease. how can we lengthen a very short straw?
Prof Chris Shaw
University College London

Friday 10 March 20.00
Getting to the heart of matter – the story of quarks
Prof Christine Davies
University College London

Monday 13 March 18.00
Breaking the spell
Prof Daniel C Dennett and the Revd Prof Alister McGrath
The RSA

Friday 17 March 20.00
Oxidative stress and cardiovascular disease. the enemy within
Prof Salvador Moncada
University College London

Thursday 23 March 20.00
Plagues and people. planning for pandemics
Prof Roy Anderson
King's College London

Friday 24 March 20.00
'Frankenstein researchers create bunny monster' – an insider explains pop science
Dr Alun Anderson
University College London

Tuesday 28 March 09.20-16.30
What makes us human?
Prof Robin Dunbar, Dr Simon Fisher, Baroness Susan Greenfield, the Rt Revd Richard Harries and Prof Charles Pasternak
Magdalen College School, Oxford

Thursday 11 May 2005 19.00
Behind the scenes of drug discovery
Prof Monique Simmonds
Jodrell Lecture Theatre, Royal Botanic Gardens, Kew.

Friday 12 May
09.30–17.30
Consciousness and anaesthesia
Various speakers
19.00
Are you comfortably numb?
Prof Mike Alkire and Prof Peter Sebel and Baroness Susan Greenfield
The Royal Society of Medicine

The Royal Academy of Engineering

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

Thursday 9 March
Future Technology Horizons
Dr Craig Barrett, Chairman, Intel Corporation
International Lecture
7 Carlton House Terrace, SW1
Contact: Clare Huddlestone
clare.huddlestone@raeng.org.uk

Monday 13 March
Nuclear Power: economics and climate protection potential
Amory Lovins, Founder of The Rocky Mountain Institute
RAEng & Forum for the Future Lecture
66 Portland Place, London W1B
Contact: Clare Huddlestone
clare.huddlestone@raeng.org.uk

Thursday 30 March
Innovation in Engineering Education Symposium
The RSA
Contact: Ian Bowbrick
ian.bowbrick@raeng.org.uk

The Royal Society of Edinburgh

22-26 George Street,
Edinburgh EH2 2PQ.
Tel: 0131 240 5000
Fax: 0131 240 5024
events@royalsoced.org.uk
www.royalsoced.org.uk
All events require registration and take place at the RSE.

Monday 6 March 17.30
Towards the Semantic Web: The Return of the Link
Professor Wendy Hall CBE FREng

Thursday 30 March all day
Dentist at the Bar
Medical Legal Interactive Conference

Thursday 27 and Friday 28 April all day
Beyond the Human Genome: Deciphering Biology and Disease
Full day conference

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 13 March 18.30
Microscopy goes cold: frozen viruses reveal their structural secrets

Monday 10 and Tuesday 11 April (all day)
Energy beyond oil - a scientific look at the various energy options
Please see www.royalsoc.ac.uk/events for the full events programme and more details about the above highlights.

Royal Society of Chemistry

Contact: benns@rsc.org
Tel: 020 7437 8656

Tuesday 28 February 12.30-15.00
Voice of the Future
Science Question Time for young scientists
The Attlee Suite Portcullis House
House of Commons London
All young scientists (20-35) welcome

Tuesday 28 February 16.00-17.00
Archives for Africa
The science capacity building initiative
The Attlee Suite Portcullis House
House of Commons London
All P&SC members welcome

The BA (British Association for the Advancement of Science)

Friday 10 – Sunday 19 March
National Science Week
Over 1,000 events across the UK. This year we will be launching "Click for the Climate", encouraging people to pledge to take action to combat climate change during the week.
www.the-ba.net/nsw

Thursday 6 and Friday 7 April
Scottish Science Communication Conference
Our Dynamic Earth, Edinburgh.
Focussing on issues in Science in Society, Science Education and Science Communication in a Scottish context.
Organised with the support of the Scottish Executive and ecsite-UK.
www.the-ba.net/scienceinsociety

Science Communication Conference will this year run on 13 and 14 July (not in May).

SCI

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

Thursday 2 March
Microwave Chemistry - Into the Process Domain; Prospects and Challenges

Thursday 16 March
Bridge Decks

Tuesday 21 March
Boosting R&D Productivity by Structured Networking

Wednesday 29 March
Young Chemist in Industry

Monday 27 – Wednesday 29 March
Pesticides in Soil and Water
University of Warwick

Thursday 30 March
Separations of Value-added Products in Food

Monday 3 April
Frontiers of Research: Synthesis of Polymers of Controlled Architecture and Structure

Tuesday 11 April
Colloid Science of Mixed Ingredients
Rideal Lecture and supporting Symposium

Tuesday 25 April
Synthesis from the Six Nations

Wednesday 27 April
Introduction to useful Physical Organic Chemistry

Thursday 11 May
Secrets of Formulation
Part I (Formulation Technology)

Sunday 14 – Wednesday 17 May
SCIpharm 2006
Edinburgh International Conference Centre, Scotland

Monday 22 – Tuesday 23 May
Proteinase

Royal Pharmaceutical Society

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

Monday 20 – Wednesday 22 March 2006
Controlled release
Product development technologies and the regulatory issues
Eleventh Arden House European Conference
Presented by the Royal Pharmaceutical Society, in partnership with the Academy of Pharmaceutical Sciences, and the American Association of Pharmaceutical Scientists
Harrington Hall, London

Wednesday 26 to Friday 28 April 2006
Pharmacovigilance of herbal medicines: current state and future directions
International Symposium
Royal College of Obstetricians and Gynaecologists,
Regent's Park, London

Sunday 14 – Thursday 18 May
Pharmacokinetic - Pharmacodynamic Data Analysis
Advanced Level Workshop
Royal Pharmaceutical Society of Great Britain and the Swedish Academy of Pharmaceutical Sciences
Cambridge, UK

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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EMOTIONS OF LIVING DONATION

Photographs and personal quotations from kidney donors and recipients have been used to develop new materials for renal and dialysis units throughout the UK.

Holly is donating her kidney to her brother John.
"I really hope he can have a normal life again. I'd like John to have what I have in life."

Tapati travelled from India to donate a kidney to her sister.
"I could see my sister's suffering and she was crying so much. All I could think was how quickly can I give my kidney."

Maggie donated a kidney to her 16 year old son Sam
"The operation was the light at the end of the tunnel."

Susan donated a kidney to her partner Richard.
"We had to do it for the kids. We had no family life."