

Science & Public Affairs

Science
teaching in
schools



Is environmentalism
good for the
developing world?



Intelligent
design



→ Contents

- **SPATalk** 4
Is environmentalism good for the developing world?
Tony Juniper and Viv Regan disagree
- **Focus** 6
Science and security
Martin Rees considers the changing of the clock
- **Shorts** 8
Do the maths: science base needs core skills to thrive... Policies in conflict: researchers allege trouble in the air... News in brief
- **Opinion** 10
Population increase will challenge development
Toby Aykroyd, Susannah Mayhew and John Cleland argue for family planning
Science and supernaturalism at the Festival of Science 11
Bruce Hood revises his opinion
- **Exchange** 12
What difference will the Human Tissue Act make?
How can science and technology work for developing countries? 14
- **Review** 26
Life in dry regions
Wendy Barnaby discovers it's sustainable
- **Correspondence** 27
The Royal Society replies to Tom Wakeford
David Boak denies restricted access
Encouraging innovation for energy supplies
Martin Ince conducts a thought experiment
- **Sounding Off** 28
Who's looking after public interest science in Britain?
Sue Ferns wants to know
- **The Wakeford Watch** 29
'We were banned from publishing'
Tom Wakeford writes an open letter to the President of the Royal Society
- **SET in Parliament** 30
The Prime Minister's speech
Ian Gibson writes the script



Editor
Wendy Barnaby
News Editor
Vanessa Spedding
Chairman of Editorial Committee
Nancy Lane

Editorial Committee

Anjana Ahuja
Lloyd Anderson
Clive Cookson
Peter Cotgreave
David Fisk
Ian Gibson
Dougal Goodman
William Gosling
Helen Haste
Alan Irwin
Clare Matterson
Ken Okona-Mensah
Kathy Sykes

Multi-reader subscriptions

United Kingdom: £50
Europe outside UK: £60
Outside Europe: £70

Science & Public Affairs is one of a number of free publications available to individual members and supporters of the BA. For free subscription, visit www.the-ba.net or contact the supporter development team by calling 0870 241 0664 or emailing supporters@the-ba.net

The magazine is available at its website, www.the-ba.net/spa

Editorial address

Science & Public Affairs
The BA, Wellcome Wolfson Building,
165 Queen's Gate, London SW7 5HD
Fax: 020 7019 4924
wendy.barnaby@the-ba.net

Science & Public Affairs is published four times a year.

The views expressed in this publication do not necessarily reflect those of the editorial committee or the BA.

©2006 British Association for the Advancement of Science.

the BA is a Registered Charity
No. 212479 ISSN 0268 490 x

Front cover picture: Rolls-Royce Science Prize:
see <http://science.rolls-royce.com>

Designed by Origin ID
www.originid.net

Printed by Holbrooks Printers Ltd,
Portsmouth, PO3 5HX

Features

- Intelligent design** 16
Rachel Ankeny asks: Why is such junk science so popular?
- Science and slavery** 18
Linda Strausbaugh celebrates a project to mark the 200th anniversary of the end of the Atlantic slave trade
- Science teaching in schools** 19
Lord Broers summarises his findings
- Good Work in turbulent times** 20
Helen Haste hears from Howard Gardner
- Donor conception in Victoria, Australia** 21
Information is available to all parties, explains Louise Johnson
- Biofuels: entangled in a policy thicket** 22
Jon Lovett picks over the prickles
- Taking the guesswork out of travel** 23
Stephen Ladyman goes data mashing
- Consulting on research into ageing** 24
Michele Corrado reveals what the public wants
- Are policy-makers interested in public engagement?** 25
Alice Taylor-Gee and Nigel Eady hope so



Science teaching in schools

This issue of *SPA* brings us up to date with developments in one of the most discussed and difficult areas of current science policy: how to ensure that more pupils study science subjects at school. Lord Broers (p.19) lays out the recommendations of his House of Lords Select Committee on Science and Technology report on science teaching in schools. Paying attention to syllabuses and careers, teaching methods and recruitment, he offers the report as a 'constructive blueprint for the future of science and mathematics in schools over the coming years.' The Shorts (p.8) also summarize the government's recently-announced measures to secure a supply of scientists, engineers, technologists and mathematicians for the country, and the dissatisfaction they have caused amongst some bodies representing mathematics.

The theme of science and development runs through several of the pieces in this issue. The spirited SPATalk (p.4) discusses whether environmentalism is good for the developing world. Tony Juniper argues it is crucial; Viv Regan is adamant that it reduces the developing world to a zoo.

An Exchange (p.14) examines what needs to happen if science and technology are to work in developing countries. Melissa Leach and Ian Scoones advocate that citizens should participate widely in setting science policy, while John Mugabe and Suman Sahai stress that the political culture needs to legitimise such participation. (It's interesting to note that Alice Taylor-Gee and Nigel Eady (p.25) find that, even when citizens do participate in a political culture which is ostensibly open to it, they still have to overcome the hurdle of interesting policy makers in the results of their discussions.) Completing the development strand, Toby Aykroyd and his colleagues (p.10) call for family planning to mitigate the poverty that population growth will intensify in the already poorest countries.

We also mark two symbolic spans of time. Next year, 2007, is the 200th anniversary of the end of the Atlantic slave trade. Linda Strausbaugh (p.18) describes a unique project in Connecticut which is celebrating the anniversary by trying to trace the geographical and ethnic origins of Venture Smith, one of the slaves brought to

America from Africa in the eighteenth century. And Martin Rees (p.6) considers how the *Bulletin of the Atomic Scientists* might change the hands of its virtual clock, whose distance from midnight indicates how precarious the *Bulletin* judges the world situation to be. He concludes that, whatever the imminent adjustment of the clock, scientists should engage with the political process to confront the threats of nuclear proliferation, as well as the unprecedented impacts of humankind on the biosphere, climate and oceans collectively.

The loss of anonymity for sperm donors in the UK has excited public discussion. The Australian state of Victoria already makes more information available to donors, children and their parents than is causing concern here. Louise Johnson (p.21) describes the Victorian situation and its consequences.

Wendy Barnaby, Editor
wendy.barnaby@the.ba-net

Is environmentalism good for the developing world?

Tony Juniper and Viv Regan disagree



Do the poorest people depend on the environment? UNEP

Dear **Tony**,

No, sadly the poorest people in the developing world are now used to justify environmental campaigns; the idea being they will suffer more from environmental problems. This lie is inexcusable.

'Vulnerability' and 'poverty' are not natural, but rather products of under-development. Development means mastering nature, not worshipping it, and in the West this has ensured we're protected against most of what nature throws at us. Yet environmentalists do not campaign to make

the developing world rich, to master nature or for global equality.

Seventy percent of the world lives a subsistence life, living off the land and just getting by. For the sake of some mythical harmonious relationship to nature, sustainability would preserve this fact. While universal prosperity is hidden away in the history books, treating the developing world as a farm or a zoo sums up environmental thinking.

Disliking what progress has given us in the West is foolish enough, imposing this

dissatisfaction on the developing world is an outrage. Be it in China, Sub-Saharan Africa or anywhere else, people want modern, urban comforts, from dishwashers to jacuzzis. Environmentalists would see this as bad news. We should see it as human progress and, with a people first approach, perfectly possible.

Yours, **Viv**

Dear **Viv**,

I see that you have not read the findings of the Millennium Ecosystem Assessment (MEA). Had you taken the time to have a look at this

exhaustive study, then you would realise that your anti-environmental rant is groundless.

Like you, the MEA observes that a large proportion of the world's population lives in subsistence economies. Such people are directly dependent on rain, soil, fish, plants and wild animals to meet their day-to-day needs. Removing or disrupting these environmental services, which is often the result of present patterns of development, undermines the already precarious welfare of the people you claim to be concerned about. Protecting the environment is not about harmony, it's about livelihoods.

The MEA concludes that, on the basis of the best available and most up-to-date evidence, if degradation of the environment continues it will be impossible to achieve world governments' Millennium Development Goals. By separating development from the need to maintain essential environmental services, you are advocating an approach that makes matters worse for poorer people, not better.

If you think that 'development' is somehow going to magically end poor people's dependence on nature, and that the environment can thus be disregarded, you are not living in the real world.

Yours, **Tony**

Dear **Tony**,

You argue that poor people are dependent on the environment, therefore we should preserve the environment. This only confirms my point. This is treating the developing world like a farm and people as zoo animals, denying their aspirations for modern comforts and urban life. The fact that you align yourself with the Millennium Development Goals which are about reducing poverty, not eradicating it, merely highlights the low horizons you have for people in developing countries. In your world it seems that poverty is acceptable for the sake of nature.

Back in the real world, you only have to open your front door to see the huge social and economic benefits development has provided us with. In the UK we live in the first post-scarcity generation and yet, instead of celebrating this monumental achievement and fighting for the rest of the world to have the same, you are denying the developing world Western levels of development. This used to be called racism; denying our common humanity across the globe and prescribing what people can and can't have in foreign lands.

We should accept and fight for nothing less than global equality.

Yours, **Viv**

Dear **Viv**,

You say the Millennium Development Goals (MDGs) are not enough, and that all poor people should have a better life, but your position lacks practical application. If the science says there is little prospect of even the MDGs being achieved because of environmental constraints, how can you seriously advocate even more 'development' without paying serious attention to environmental issues? Again, I encourage you to go back to the scientific literature before launching into a rant.

Take the question of carbon dioxide emissions.

We presently have about one billion people emitting carbon dioxide broadly at the level of the UK. Suggesting that it is possible to equip six billion with a similar level of consumption is pure fantasy. Taking that course (which is broadly the course we are on) is an act of collective suicide, and the pain will be felt first, and most harshly, in the developing countries. Rapid climate change will in many countries cause massive economic damage and humanitarian tragedy. Do you really believe that would help development and end poverty?

If you are serious about equality, you should be advocating an approach based on a reduction in the resource consumption of the unsustainable northern countries, not suggesting that everyone can get up to our level.

Yours, **Tony**

'In your world it seems that poverty is acceptable for the sake of nature'

'You cannot pose a choice between environmental and development goals: you have to pursue both'

Dear **Tony**,

The scientific literature is of course important, but meaningless without some social science. Animals rely on ecosystems to find drinking water, but people do not. We rely on social developments that help us overcome nature. So people in London do not rely on this week's heavy rainfall in local streams, but instead on our network of pipes, reservoirs, dams and sewage works. The reason why the poor suffer most in disasters is because they lack society-wide development.

Development solves problems, provides energy solutions such as nuclear power or large-scale hydroelectric power and, into the

future, offers fuels from genetically modified plants. We might even inject aerosols into the atmosphere to reflect the heat, or find cleaner technologies such as nuclear fusion. Without the development which you reject, solutions that could really impact on our lives will remain unexplored, leaving us all to make do and mend.

At a time when humans are rocketing to Mars, you argue that halving the amount of people living on a dollar a day or less is just not realistic. How profoundly anti-human! WORLDwrite will continue to demand the best for all, and a world where people live beyond your wildest dreams.

Yours, **Viv**

Dear **Viv**,

Of course people in London rely on nature. Where do you think the raw materials and food that sustain their lifestyles come from? You may not have noticed, but the process of development that you advocate is not using nature as a springboard for the ending of poverty. It is first and foremost a process of liquidating environmental capital for excessive consumption in the northern industrialised countries.

Land, forests, minerals and fisheries are under pressure across the developing world, in large part for export. The idea is that exporting will help countries escape from poverty, but it removes the resources from under the noses of the people who depend on them directly. This is being done with the enthusiastic backing of 'development' advocates like you. Not only is sustainable development in the poorer exporting countries thus being undermined, the livelihood for millions is being removed.

It is futile to insist that environmental constraints don't exist. They do, and they are an increasingly important dimension of poverty. Get real Viv, and see that you cannot realistically pose a choice between environmental and development goals: you have to pursue both, otherwise it will be impossible to achieve either.

Yours, **Tony**

Tony Juniper

is the Executive Director of Friends of the Earth
tonyj@foe.co.uk

Viv Regan

is Assistant Director at WORLDwrite
vivregan@btconnect.com

Science and security

Martin Rees considers the changing of the clock

The *Bulletin of Atomic Scientists* was founded at the end of World War II by a group of physicists, based in Chicago, many of whom had worked at Los Alamos on the Manhattan project. The logo on each issue's cover is a clock, the closeness of whose hands to midnight indicates how precarious the world situation is – or is thought to be by the *Bulletin's* editorial board.

The threat of all-out nuclear war – a threat far worse than any that had previously imperilled our species – hung over us for forty years. At any time during the Cold War, the superpowers could have stumbled towards Armageddon through muddle and miscalculation. When the Cold War ended, the risk plainly eased; the *Bulletin's* clock was put back to 17 minutes to midnight. There was thereafter far less chance of tens of thousands of bombs devastating our civilisation. Since then, the hands have crept closer to midnight, as global security has again deteriorated. The clock was last changed in 2002, when the hands were set at seven minutes to midnight.

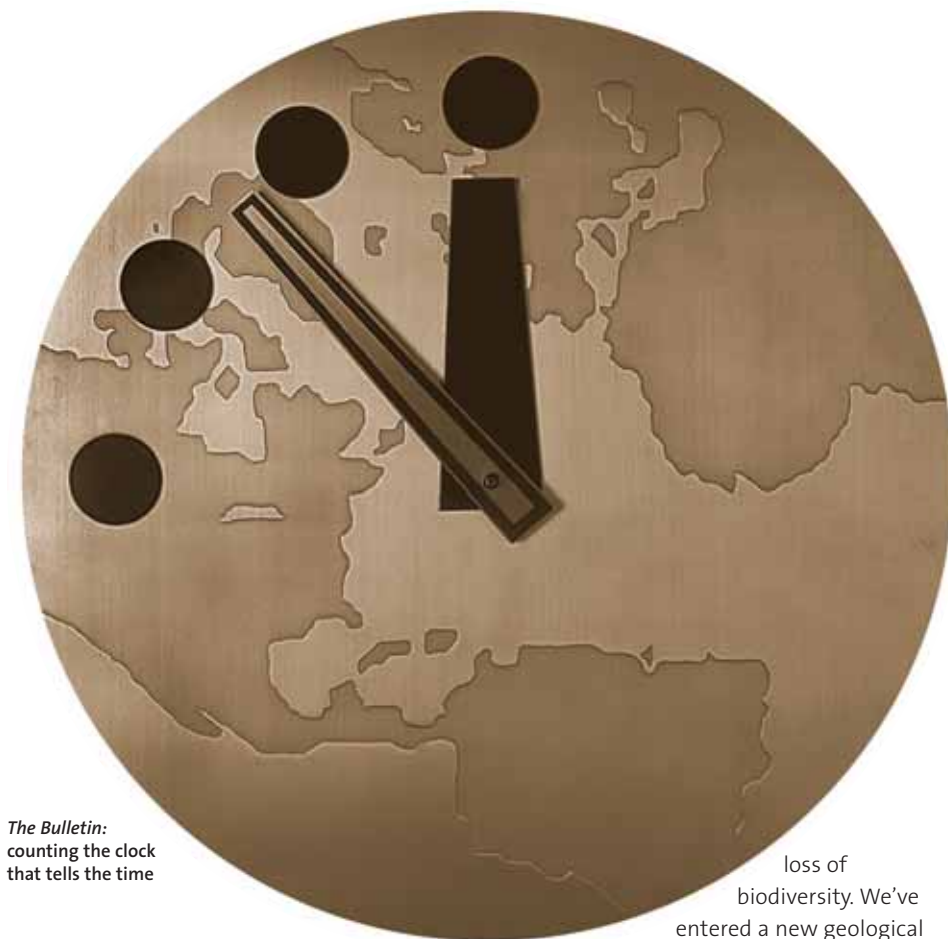
The *Bulletin* is once again considering whether to change the place of the hands. Should they approach even nearer to midnight, indicating that the danger of global disaster has grown, or should they stay the same? Or even go back?

Looking ahead

The catastrophic threat could be merely in temporary abeyance. In the last century, the Soviet Union rose and fell: there were two world wars. In the next hundred years, geopolitical realignments could be just as drastic, leading to a nuclear standoff between new superpowers that might be handled less well (or less luckily) than the Cuban crisis was. And there is now more chance than ever of a few nuclear weapons going off in a localised conflict.

We are confronted by proliferation of nuclear weapons (in North Korea and Iran, for instance). Terrorists might some day acquire a nuclear weapon. If they did, they would willingly detonate it in a city centre, killing tens of thousands along with themselves; and millions around the world would acclaim them as heroes.

The nuclear threat will always be with us. But it is based on basic science that dates



The *Bulletin*: counting the clock that tells the time

from the 1930s. What are the potential impacts of 21st century science? There are grounds for being a techno-optimist. The technologies that fuel economic growth today – IT, miniaturisation and biotech – are environmentally and socially benign. They're sparing of energy, and of raw materials. They boost the quality of life in the developing as well as the developed world, and have much further to go. That's good news.

But we can plausibly predict some disquieting trends. These may not threaten a sudden world-wide catastrophe – the doomsday clock is not such a good metaphor – but the threats are, in aggregate, as worrying and challenging.

Current threats

Some threats are environmental: rising populations, especially in the megacities of the developing world, increasing energy consumption, and so forth. Collective human actions are transforming, even ravaging, the entire biosphere – perhaps irreversibly – through global warming and

loss of biodiversity. We've entered a new geological era, the Anthropocene. We don't fully understand the consequences of our many-faceted assault on the interwoven fabric of atmosphere, water, land and life.

Humans are collectively endangering our planet, but there are novel and growing vulnerabilities from individuals too

Humankind's collective impacts on the biosphere, climate and oceans are unprecedented. These environmentally-driven threats – 'threats without enemies' – should loom as large in the political perspective as did the East/West political divide during the Cold War era. Unless they rise higher on international agendas, remedial action may come too late to prevent runaway climatic or environmental devastation. The UK government, at the 2005 Gleneagles G8 Summit and in follow-up activities, has taken a welcome lead.

Humans are collectively endangering our planet, but there are novel and growing vulnerabilities from individuals too. Biotech is becoming ever more empowering; cybertech interconnects us ever more closely. Even a single technically-capable person will soon have the capability to cause massive disruption through error or terror. The relevant techniques and expertise will be accessible to millions – they do not require large special-purpose facilities, as nuclear weapons do. It would be hard to eliminate the risk, even with very intrusive surveillance.

At the moment, science is applied suboptimally. The benefits of new technology accrue mainly to the developed world; huge resources are devoted to developing new weaponry. In medicine, the focus is disproportionately on cancer and cardiovascular studies, the ailments that loom largest in prosperous countries, rather than on the infections endemic to the tropics.

Opinion polls show that people are positive about science – indeed they trust scientists (especially those in academia) more than they trust most other trades and professions. But they're worried that science's applications could be running out of control. There'll be more and more 'doors that we could open but which are best left closed' – for ethical or prudential reasons.

Scientists and policy

The Royal Society has an active policy unit, and an extensive 'Science and Society' programme. We can draw on very wide expertise to clarify key issues – and perhaps identify them before others can. We disseminate our reports to policy makers, the media and the wider public. We hope in coming years to broaden and strengthen these efforts.

@ a glance...

The logo on the cover of the *Bulletin of the Atomic Scientists* is a clock whose hands indicate how precarious the world situation is thought to be

Currently, the hands stand at seven minutes to midnight

The *Bulletin* is considering whether to change the time on the clock

We face threats of nuclear proliferation, and unprecedented impacts of humankind on the biosphere, climate and oceans collectively

Academic scientists have particular responsibility for the way their science is applied

Scientists should engage with the political process to confront the threats

The Society's formal reports, and our responses to government consultation, focus on scientific and technical issues where we claim expertise and can present a consensus view. But no important policy choice is solely scientific: strategic, economic, social, and ethical ramifications enter as well. On these broader questions, scientists have no special credentials and won't necessarily have a consensus view.

However, it would surely be welcome if many more individual scientists – with views spanning the entire political spectrum – engaged more willingly with the media and in political fora, especially in debating the crucial long-term issues that tend to be sidelined by seemingly urgent but less important ones.

There will be ever more political choices with a scientific dimension – energy, environment, and medicine and bioethics. How science is applied and prioritised shouldn't be decided by scientists alone. These choices should be made after the

widest possible discussion, but mindful of the best scientific evidence available.

Scientists' responsibility

But scientists surely have a special responsibility. The physicists who founded the *Bulletin of Atomic Scientists* set us a fine example. They didn't say that they were 'just scientists' and that the use made of their work was up to politicians. They took the line that scientists should not be indifferent to the fruits of their ideas – their intellectual creations. They should try to foster benign spin-offs of their research, but constrain, so far as they can, the threatening 'dark side'. Academic scientists have a special obligation because they have more freedom than those in government, or those subject to commercial pressures.

How might the *Bulletin* set the clock?

21st century technology, if optimally applied, could offer immense opportunities, for the developing and the developed world. On these grounds, the hands might move away from midnight. But it will present new threats more diverse and more intractable than nuclear weapons did. Perhaps the hands should move towards midnight, after all.

Whatever the *Bulletin* decides, scientists need to channel their efforts wisely and engage with the political process nationally and internationally, if we are to confront these threats successfully. We shall need, in all fields of science, individuals with the wisdom and commitment of the atomic scientists who founded the *Bulletin*.



Environmentally-driven threat: tropical storm Stan damage in Guatemala

Lord Rees of Ludlow
is President of the Royal Society
martin.rees@royalsoc.ac.uk

Shorts

In brief

Ethics of egg donation

The HFEA (Human Fertilisation and Embryology Authority) is running a consultation that will inform the development of new guidance on whether women should be able to donate their eggs for use in stem cell research. The consultation will run until November with a decision expected in February 2007. Guidance and any regulatory measures will follow in spring 2007. www.hfea.gov.uk

Limits to biofuels?

The Royal Society is conducting a study into the potential of the next generation of biofuels to provide economic, low-carbon fuel for transport. The study will explore how science could address issues such as the potential competition between food crops and energy crops, for example by establishing whether different parts of food crops could be converted into biofuel. A report on findings is planned for autumn 2007.

Defra's new wiki

Defra (Department for Environment, Food and Rural Affairs) is turning to the public to help it draft an 'environment contract' for the UK – by means of a website that can be edited by users (a wiki). Defra, which describes the wiki as 'an experiment in collaborative working', hopes it will enable everyone to take part in solving environmental problems like climate change and loss of biodiversity. <http://wiki.defra.gov.uk/WikiHome>

20 per cent by 2020

The European Commission has unveiled its Action Plan on Energy Efficiency, which aims to bring about a 20 per cent cut in European energy consumption by 2020 by means of 75 new measures. These are designed to make appliances, buildings, transport and energy generation more efficient, and include stringent energy efficiency standards and specific financing mechanisms. http://ec.europa.eu/energy/action_plan_energy_efficiency/index_en.htm

Do the maths: science base needs core skills to thrive

The government's recently published report on its Science, Engineering, Technology and Mathematics (STEM) programme¹ has elicited criticism about its lack of focus on mathematics.

It looks unlikely to alleviate widespread dismay at the declining numbers of people studying science at A-level and beyond.

New structure

The STEM programme is a cross-cutting initiative from the DfES (Department for Education and Skills) and the DTI (Department of Trade and Industry), designed to secure a supply of scientists, engineers, technologists and mathematicians for the country, as set out in the government's Science and Innovation Investment Framework 2004–2014. The report lists a number of actions for the coming months to address the problem, focusing initially on the creation of a new governance structure for STEM. This will feature a ministerial steering group and a high-level strategy group; the latter's role will be to coordinate STEM initiatives across all stages of education and report to ministers.

Members of the strategy group will include the DfES, the DTI, the Royal Society, the Royal Academy of Engineering, the Association for Science Education, the Wellcome Trust and business representatives; they will also run their own networks to bring in the views of others, such as the newly formed Science Community Partnership Supporting Education (SCORE).² Once the structures are in place, focus and funding will be directed towards the National and Regional Science Learning Centres, the National Centre for Excellence in the Teaching of Mathematics, and national STEM schemes for schools.

Underestimating maths

However, some are concerned at not being invited to the party. 'The government is in danger of undermining its own efforts to boost the science base in the UK,' according to the Council for the Mathematical Sciences (CMS). The CMS represents the Institute of Mathematics, the London Mathematical Society and the Royal Statistical Society to government and other public bodies. Its chair, Sir David Wallace, warned that by underestimating the contribution made by mathematical sciences, the government's STEM strategy could fail.

He explained: 'Too often in the report the mathematical sciences are considered separately from the other sciences when in fact they are the core of most science, technology and engineering.' He called for the government to include representatives from the mathematics community at the heart of its STEM governance structures and as equal stakeholders to the project.

Sir David's views were shared by Professor Peter Main, Director of Science and Education at the Institute of Physics: 'It is certainly true that an appreciation of mathematics is essential for science and engineering, and for physics in particular,' he told *SPA*. 'One of the most common concerns of physics departments is that the incoming students are not as well prepared in mathematics as they would like them to be.'

1. See www.dfes.gov.uk/hegateway/uploads/STEM%20Programme%20Report.pdf

2. SCORE comprises the Institute of Physics, the Royal Society of Chemistry, the Institute of Biology, the Biosciences Federation, the Science Council, the Association for Science Education and the Royal Society.



Mathematics is essential for science and engineering

Policies in conflict: researchers allege trouble in the air



We should pay more for flying, say researchers

A report from Oxford University's Environmental Change Institute, which highlights the mismatch between government's climate change policy and its aviation policy, has elicited indifference from the DTI (Department of Trade and Industry) and airlines, despite approval from the government's Sustainable Development Commission.

The report, *Predict and Decide: Aviation, Climate Change and Policy*¹, which was commissioned by the government-funded UK Energy Research Centre, concludes that a radical shift in strategy is required if the UK's climate change targets are to be met.

Higher air charges

It points out that, while the UK Government is committed to a 60 per cent reduction in CO₂ emissions between 1990 and 2050, its recent aviation White Paper would allow air passenger movements to double from 2003 to 2030. Its analyses show that, to meet its CO₂ targets, the government will have to curb overall air travel. The researchers suggest increasing air charges and scrapping airport expansion plans as first steps.

'Making flying more expensive, by introducing new taxes...offers one of the quickest ways to address the demand for air travel,' says the report, which supports increased air passenger duty and adding VAT to airline tickets.

Government response

However, the government and airlines have

said a 'balanced approach' is needed. They prefer to wait until the aviation industry is introduced into the European Emissions Trading Scheme (ETS), when its activities will be regulated by the requirement for big emitters to buy carbon emissions credits on the open market.

The British Air Transport Association (BATA) supported this argument with results from a recent survey, which concluded that 48 per cent of the public felt that the environmental costs of air travel should be met by international emissions trading, and only 32 per cent preferred the idea of a green tax on tickets.

Watchdog reaction

The government's sustainable development watchdog, the Sustainable Development Commission, is sceptical about relying solely on the ETS. Dr Bernard Bulkin, its Commissioner for Energy and Transport, told *SPA*: 'We have a problem with increasing emissions from aviation and it's largely fuelled by discount airlines. We uphold the widely accepted principle of "polluter pays", and that's just not happening in aviation.'

He emphasised that the Commission supports emissions trading schemes, but reiterated the Oxford team's conclusions that they are unlikely to achieve enough in time. The second phase of the ETS (which would include aviation) will not come on line until 2008 at the earliest and will most probably take until 2012.

'There needs to be an increase in air passenger duty,' said Dr Bulkin. 'Money from such a duty should be hypothecated against a climate change research programme focused on technological advances that would help solve the problem.' This, he suggested, would augment the UK's strong position in the international airline industry by giving it valuable intellectual property that it could sell elsewhere.

1. See www.eci.ox.ac.uk/research/energy/predictanddecide.php

Vanessa Spedding
is the Shorts editor
vs@mortimerpress.com

In brief

Legal query over GM proposals

At the close of Defra's consultation on proposals for managing the coexistence of GM, conventional and organic crops, two specialists in European law concluded that Defra's proposals are 'legally and fundamentally flawed'. The legal opinion of lawyers Paul Lasok QC and Rebecca Haynes, commissioned by Friends of the Earth, The Soil Association and GM Freeze, are available from www.foe.org.uk

Science body for Wales?

CaSE (The Campaign for Science and Engineering) has welcomed the outcomes of the Welsh Assembly's review of science policy, urging the Welsh government to implement the key recommendations quickly. These include that Wales should have a full-time Chief Scientist and a Science Advisory Council, to include business leaders from inside and outside Wales. www.wales.gov.uk/index.htm

Investors sought for new energy institute

The Department of Trade and Industry is inviting expressions of interest in its proposals for a new Energy Technologies Institute. Government will commit £500m to the Institute over the next decade and is looking for matched commitment from companies. The focus will be on research into secure, reliable and affordable low carbon energy technologies. www.dti.gov.uk/science/science-funding/eti

Data laws by-passed in crime proposals

FIPR (The Foundation for Information Policy Research) has criticised measures proposed in the Home Office consultation, *New Powers Against Organised and Financial Crime*, to deal with internet fraud. FIPR claims that the measures risk flouting data protection and human rights laws, and that proposals overlook the need for consent before data sharing. 'There is a serious risk that large sections of the public sector will come to rely on systems that will eventually be found to be illegal under European law,' says FIPR.

Population increase will challenge development

Toby Aykroyd, Susannah Mayhew and John Cleland argue for family planning

Global population is set to rise by 40 per cent to 9 billion over the next 45 years, presenting a challenge to the future of our planet that should rank in importance alongside climate change.

Poverty mitigation

Future increases in world population will be concentrated among the poorest countries with the weakest institutional capacities to respond to the challenges of rapid population growth.

Equally, large increases in population will create high levels of unemployment and underemployment, making the alleviation of mass poverty much less likely. This case has, for example, been compellingly argued for India.

Rapid increases in population already put serious pressure on water and land for increased food production, a scenario particularly acute for Africa. Research in 19 African countries has concluded that resource scarcities, lack of fertile land, limited potential for crops and increasing urbanization are all largely driven by populations set to treble by 2050, in countries like Niger, Mali, Burkina Faso and Somalia, making it impossible for them to attain sustainability in food. In such settings a sharp fertility decline is critical to help reduce the risk of future population pressure.

Considerable evidence now exists to show the contribution of fertility decline to economic development. Fertility and mortality decline comprised about 20 per cent of average annual growth in per capita



Countries with high fertility are more likely to endure civil conflict

output in developing countries between 1960 and 1995. A study of 45 countries estimated that the average poverty incidence would have fallen by one third if the crude birth rate had fallen by five per 1,000 in the 1980s.

Civil Conflict

High levels of unemployment and disaffection consequent on population increase are also linked with unrest. Recent research has found a 'striking and consistent' correlation between countries with high fertility and an increased likelihood of civil conflict. This was exacerbated where the countries had very high numbers of young adults (below 29 years) – predominantly in sub-Saharan Africa and the Middle East.

Climate change and environmental degradation

UK Government Chief Scientist Sir David King acknowledged to the All Party Parliamentary Group on Population, Development and Reproductive Health earlier this year, that 'population change is linked directly to climate change'.

Extravagant consumption patterns in industrialised nations are the biggest contributors to pollution and carbon dioxide emissions. However, with 95 per cent of population increase set to occur among less developed countries, as they understandably seek to achieve a higher standard of living, they will also contribute more to accelerating climate change. In Indonesia, India and China, fossil fuel consumption has increased by 50-65 per cent just in the last decade.

Loss of natural habitat and biodiversity are a further direct consequence of burgeoning populations. Increasing pressure on fertile land leads to growing encroachment onto marginalised areas hastening environmental degradation.

How do we tackle population growth?

The single most effective way of reducing population growth is through massive investment in family planning programmes. Yet international funding and promotion of family planning has severely waned in the past decade – and at least 150 million couples lack access to family planning information and services.

Governments' commitments under international treaties must be met, and funding increased. As Secretary General of the United Nations, Kofi Annan recognised this in Bangkok in 2003: 'The Millennium Development Goals, particularly eradication of extreme poverty and hunger, cannot be achieved if questions of population and reproductive health are not squarely addressed. And that means stronger efforts to promote women's rights, and greater investment in education and health, including reproductive health and family planning.'

Parliamentary Hearings to assess the impact of population increase were held at Westminster this summer. Taking evidence from nearly 50 organizations worldwide, these have underlined the gravity of the situation.

Family planning must become a development issue of the most urgent priority.

December event

On 6 December 2006, at the Royal Geographical Society in London, three influential figures from the fields of politics, business and media will come together for a meeting called *Population: the greatest challenge?* to express their profound concerns about global population increase. They are Adair Turner, former Director-General of the Confederation of British Industry, John Simpson, celebrated broadcaster and now Senior Editor of the BBC's International News, and Richard Ottaway MP, Chairman of the UK All Party Parliamentary Group on Population.

Toby Aykroyd

is Co-Chair of the Population and Sustainability Network
www.populationandsustainability.org
ta@populationandsustainability.org

Dr Susannah Mayhew and Professor John Cleland are at the Centre for Population Studies, London School of Hygiene & Tropical Medicine
susannah.mayhew@lshtm.ac.uk;
john.cleland@lshtm.ac.uk

Science and supernaturalism at the Festival of Science

Bruce Hood revises his opinion



Mind and matter: making brains at the Festival of Science

This year's BA Festival of Science in Norwich generated much controversy because of the inclusion of a symposium on supernatural research.

The symposium, *Beyond the Brain: Making Science Personal*, supposedly addressed the question of whether the mind could literally exist beyond the brain. However, it was sponsored by an organization dedicated to supporting the supernatural, and all the speakers apart from a discussant were proponents of life after death experience, telepathy and mind control.

Initial opposition

I think all such work is premised on the dualism of mind and brain, asserting that the mind is not tethered to the brain under normal physical laws but free to roam across space and time. This is something that most scientists reject outright. Looking at the line-up, I was convinced that there would not be a balanced argument and the conclusion would be biased. I even wrote to the Festival organizers beforehand, threatening to withdraw in protest.

To be honest, I was concerned that the symposium would overshadow my presentation the day before on the origins of magical belief in adults. It would directly contradict my conclusions by arguing that the supernatural was a real phenomenon and not a delusion. I was also annoyed that the symposium would draw the most press attention and portray supernatural research as a legitimate scientific pursuit.

As it turned out, I was wrong on both

points. To my surprise, my theory on the origins of magical belief generated considerable media attention and subsequent controversy. It transpired that, unexpectedly, I had managed to upset both sides of the current science *versus* religion debate.

Rational and magical explanations

My theory takes the middle position between the fundamental religions on one side, and the ultra-atheist position on the other, represented most conspicuously by Richard Dawkins.

I have the utmost respect for Richard Dawkins, as *The Selfish Gene* inspired me to become a behavioural scientist. However, I think that the world does not neatly divide into supernaturalists and atheists. Rather, I think that most individuals entertain a mixture of beliefs that may be held implicitly. So I think there is good reason to question the charge that religions are solely responsible for propagating supernatural beliefs. Rather, they simply capitalise on natural intuitions that there are unseen forces at work in the world.

I maintained that the mechanisms for understanding the world operate as early as we can measure them, and lead to both rational and magical models of explanation. Somehow this was translated into the simplistic sound bite that humans are hard-wired for superstition and religion.

My evidence was called into question. Can we prove a disposition to believe in magic? No. But we can prove that infants are generating models of the physical, biological and psychological world around them by making inferences that involve positing

unseen mechanisms. This process of intuitive reasoning leads to misconceptions that ultimately underpin adult magical beliefs.

Evidence and belief

So should the BA have included either my lecture or the supernatural symposium? I was wrong to assume that the press would be uncritical of supernaturalism. They did focus on the supernatural symposium, but most of the science journalists questioned the wisdom of allowing such a platform at a science festival. However, as Rupert Sheldrake, the main proponent of disembodied mind research pointed out to me, he had evidence, whereas my theory was based on logic and evaluation of existing findings. How ironic that I would end up being the one accused of non-scientific activity by many critics.

The BA meetings have a history of showcasing radical theories. The difference between my theory and the supernatural lobby is that science has already investigated, considered and made pronouncement of the scientific credibility of supernaturalism, and the verdict is a resounding 'No!'. That is why scientists were upset by the inclusion of this symposium.

Supernaturalism will not just lie down and die, and I think my theory explains why. Personally, I am glad that the paranormal symposium was included in the Festival, as it directly bore out my contention that even educated, intelligent people believe in supernaturalism. It also dramatically highlighted the power of belief in deciding which evidence to pay attention to. You cannot prove that the supernatural does not exist. You have to make a decision based on the balance of evidence, and that decision is motivated by belief. I propose that intuitive processes are critical to belief, but it remains to be seen whether my ideas will suffer the same fate as supernaturalism.

For the moment at least, science has still to make its mind up about me.

Bruce Hood
is Professor of Developmental
Psychology at the University of Bristol
bruce.hood@bristol.ac.uk

What difference will the Human Tissue Act make?

The Human Tissue Act 2004 came into effect on 1 September 2006. Under its provisions, introduced in the wake of the organ retention scandals at the Alder Hey Hospital and the Bristol Royal Infirmary, it is an offence to retain bodily material with the intention of analysing the DNA, without the consent of the individual from which it was obtained (or those close to them if they have died). It also establishes the Human Tissue Authority to regulate the removal, storage and use of human tissue.

Not much, for pathologists

We've already changed, says Peter Furness

We hope that the legislation will provide necessary reassurance to the public that our work is being properly regulated.

The legislation undoubtedly provides a framework for those of us who use human tissue for the benefit of society to carry on our work, knowing that what we are doing is lawful. To that extent the implementation of the Act is an improvement, though we still struggle to understand the legal complexities of what is and is not lawful. There is a danger that excessive caution and fear of the law may inhibit legitimate work done for the benefit of patients. Hopefully this problem will decline as we become more familiar with the rules.

For pathologists, the big changes happened at the time of the 'organ retention scandal' in 2000. We had acted in good faith, but our assumptions about the acceptability of retaining organs at post mortem were invalid. Practice changed almost overnight. So in relation to the big issue, implementing the Act in 2006 makes comparatively little difference.

The main practical difference from 1 September 2006 is the requirement for Human Tissue Authority licences. Obtaining such licences is proving time-consuming and expensive, using resources which would otherwise be available for healthcare. But if the public, through our elected representatives, decides that the cost is worth paying, then it must be paid.

Effects of the scandal

Since 2000, we do far fewer 'consent' post



Human tissue: no analysis without consent

mortems – not because consent is not forthcoming, but because relatives are rarely asked. Causes of death are less rigorously investigated by microscopic examination of tissue. It is now possible to prosecute someone who behaves as Professor van Veltzen did at Alder Hey – a change which most pathologists applaud.

But contrary to public perception, post mortems are not actually our 'core business'. Most pathologists diagnose disease in living patients, by examining samples of their blood or tissue. In England (but not Scotland) the new legislation covers tissue from the living – and 'tissue' even includes urine and faeces.

Research using surgically resected tissue underlies our classification and understanding of many diseases, especially cancer. We feared

that new requirements for explicit consent would inhibit this work. We don't meet the patients, and for us to discover what they want after they have gone home is rarely practicable. Such research has indeed been reduced dramatically; but again, this happened six years ago due to the introduction of a requirement for 'research ethics' approval.

So for NHS pathology departments, change has already happened.

Professor Peter Furness
is Vice-President of the Royal College
of Pathologists
peter.furness@rcpath.org

No new dawn for organ donation

But Chris Rudge is cautiously optimistic

I would hope and expect that, in time, the new legal context for donation would be translated into more organ donors, more transplants and fewer patients dying unnecessarily without a transplant.

The shortage of donated organs and tissues for transplantation is a major problem. There are approximately 8,000 patients currently waiting for an organ transplant, of whom 500 to 1000 will die every year before a transplant becomes available.

In principle, all donation laws fall into one of two categories: 'opting out', whereby consent for donation is assumed unless an objection has been registered by the individual, or 'opting in', which assumes nothing and requires a positive act of consent.

The Human Tissue Act 2004 is in essence an 'opting in' form of legislation. It puts positive consent for donation at the core of the requirements. Consent may be given in life by an individual, most pertinently by

registration on the national NHS Organ Donor Register (ODR). Any such consent given by the individual may not in law be overridden by the donor's relatives. If consent has not been given in life, the Act sets out precisely who may lawfully consent on behalf of the individual.

Altering behaviour

At present, when an individual has registered on the ODR, their relatives override this wish in approximately 10 per cent of occasions. It is also known that if the individual is not registered on the ODR, approximately 40 per cent of relatives refuse permission for donation. Finally, figures show that over 90 per cent of the public agree in principle with organ donation themselves.

Therefore, for the Act to have a beneficial effect on donation, it will need to influence these patterns of behaviour and belief. If

nine in ten of us believe in donation ourselves, and if we all registered on the ODR (as 22 per cent of the population already has), and if our relatives indeed respected our wishes, as the law requires them to do, the positive impact would be very considerable.

However, realistically the impact will not be so great. 'Only' one million extra people per year register on the ODR and no transplant surgeon would remove organs – however lawfully – in the face of implacable hostility from the donor's family.

The Organ Donor Line is on 0845 60 60 400.

Chris Rudge
is Managing and Transplant Director
of UK Transplant
chris.rudge@uktransplant.nhs.uk

Better regulation

Adrian McNeil is enthusiastic

How the Human Tissue authority (HTA) operates as a regulator will be the litmus test of whether the Human Tissue (HT) Act will make a real difference.

Post mortem services, anatomy schools, establishments storing tissue for research or human application, and sites displaying human tissue now need a licence to operate lawfully. The HTA also regulates all transplants involving living donors.

The first key difference is that the HT Act and the HTA have created a clear, practicable framework in which professionals and the public can have confidence. We know that people want to donate their tissue and organs, providing they are asked; and we also know that professionals feel reassured if they know they are working within legitimate boundaries. The key is to harness the confidence that this framework engenders.

Helping research and donations

Tissue-based medical research must continue to thrive in the UK. But to help it do so, researchers should know where they can get

the tissue they need (not always easy if specialist tissue is required) and that its integrity has not been impaired by the way it is stored. A happy side-effect of regulation is that tissue collections are coming together under one governance system, so more – rather than less – tissue of good quality will become available.

These changes add up to improving the quality of life for more people and, in some cases, even saving lives

We all know that the number of people waiting for a kidney is long and growing. The HTA has introduced two new ways in which living people can donate their organs – paired/pooled and altruistic donation. And the HT Act makes clear that, in law, the wishes of the deceased to donate an organ take precedence. This means that relatives can no longer overrule a person's wish to

donate organs or tissue. Taken together, these changes add up to improving the quality of life for more people and, in some cases, even saving lives.

Even though regulation is acknowledged to help improve standards and consistency, it still has a bad name because the tendency has been to over-regulate. That is why we are determined to be as light-touch as possible – to regulate on the basis of risk and to make every effort to avoid duplication with other regulators. This has been something of an experiment, but it has worked. And who knows – others might follow!

More information: www.hta.gov.uk

Adrian McNeil
is Chief Executive,
Human Tissue Authority
enquiries@hta.gov.uk

How can science and technology work for developing countries?

A recent pamphlet¹ by Melissa Leach and Ian Scoones argues that science and technology should be part of a bottom-up, participatory process of development, where citizens themselves take centre stage. They explain, and John Mugabe and Suman Sahai comment.



Modern technology must benefit local farmers

Forget the race to the top

The slow race is best, say Melissa Leach and Ian Scoones

There are two dominant global science races: the race to the top in the global economy, and the race to the universal fix. Yet we are overlooking a third, less glamorous, but ultimately more important, 'slow' race to citizens' solutions.

This emphasises pathways to poverty reduction which may involve science and technology, but are specific to local contexts. It recognises that technological fixes are not enough, and that social, cultural and institutional dimensions are also key.

The core challenge is how to involve people, especially marginalised people, in decisions about innovation, regulation and technology development. This requires a new vision of citizenship that goes beyond 'public engagement with science'. It needs more active engagement with broader questions about how science and technology agendas are framed, the social purposes they serve, and who stands to gain or lose from these.

Next steps in the slow race

We recommend the piloting of a series of

Citizens' Commissions for Science and Technology Futures to facilitate wider deliberation on technology choice and modes of regulation.

The commissions would vary geographically and have diverse foci. Some would be long-term, others temporary. And they would make use of a variety of different media, from face-to-face 'public space' interactions, to online fora, blogs and virtual deliberative communities.

To work well, they would need to go hand-in-hand with developing the capacity of citizens to gain access to, and reflect on, diverse sources of information about technologies and their implications. Their institutional arrangements and operating practices would need to connect to existing institutions and adapt to particular political cultures.

Government strategy

Today, we are seeing an unprecedented level of international interest and investment in linking science, technology and development.

This comes on the back of rapid advances in IT, biotechnology and nanoscience. These hold out the promise of new drugs, vaccines and seeds, and generate claims of breakthroughs that could solve poverty, illness and environmental decline. As we await the forthcoming Science and Innovation Strategy from the Department for International Development, a key question will be whether it can lead the way in meeting the challenges of the slow race to citizens' solutions.

For further information:

<http://www.ids.ac.uk/ids/KNOTS/index.html>

Professors Melissa Leach and Ian Scoones are in the Knowledge, Technology and Society Team at the Institute of Development Studies, University of Sussex
m.leach@ids.ac.uk
i.scoones@ids.ac.uk

Making citizens' participation work

Political culture is crucial, argues John Mugabe

On the whole, creating commissions is not a guarantee for citizens' participation in science and technology policy-making. More is required.

Citizens' participation in science and technology policy processes cannot be reduced to the mere organization of commissions, public hearings events or consensus conferences involving ordinary people.

Different institutional arrangements are needed for different political cultures. The nature and level of democratic governance largely determine the kinds of institutional arrangements best suitable for citizens' participation.

What democracies can do

Democratic regimes are expected to create political space for citizens to articulate their views and hopefully influence the design of technology missions and programmes. There are constitutional obligations imposed on

such regimes to help citizens' participation in decision-making.

In such circumstances, government is often required to ensure that citizens have access to the necessary information. Access to information, including on scientific and technical issues, is a citizen's right. Courts of law are there to enforce it.

Non-democratic governments

These are unlikely to allow citizens to coalesce around public issues and engage in debates on science and technology. Citizens' commissions are likely to be perceived or treated by such governments as institutional arrangements that undermine the authority of those in executive positions or power.

The challenge in these circumstances is not to create commissions but to enlarge constitutional foundations for citizens' participation in public policy. This would involve introducing into national

constitutional provisions the right to access information as an entitlement, and vesting responsibility on government to make information available to citizens. It will also require protection of press freedom in order to ensure that the media plays an active role in science communication.

A political culture and related constitutional provisions that give liberties or freedoms to citizens to know and voice their views and concerns are necessary to democratize science and technology decision-making.

Dr John Mugabe

is Director of the NEPAD (New Partnership for Africa's Development) Office of Science and Technology, and a member of the African Ministerial Council on Science and Technology
john@nrf.ac.za

Local conditions must determine development

Small farmers must benefit, asserts Suman Sahai

A new agricultural technology must have a strong local context to be meaningful, and the agenda must be determined by local stakeholders.

There are many indigenous technologies and knowledge systems that work well for rural communities because they are affordable, accessible and communities are skilled in their use. New technologies must neither displace nor diminish such indigenous technologies.

All technologies, but especially those related to food and agriculture, must be adopted in developing countries only if small farmers and rural communities can benefit from them.

The research goals must be determined by the needs of local agriculture, not imported as a package as is the case currently with Bt (genetically modified insect resistant) and Herbicide Tolerant (HT) crops. A technology developed for industrial agriculture is unlikely to work for resource-poor farmers in developing countries because it is usually more expensive, it can be irrelevant or even harmful and it is alien in its application.

Unsuitable developments

Growing Bt cotton is expensive and has

complex requirements: maintaining non-Bt refuges and counting insects to determine when an insecticide spray is required. This places great financial burdens and provides opportunities for things to go wrong.

HT crops constitute a labour-saving technology. This is absolutely wrong for labour-surplus developing countries where agricultural operations like weeding, threshing and winnowing provide much needed wages to an agricultural labour force. In addition, weeds that would be destroyed by herbicide application serve as leafy green vegetables for the family, fodder for livestock, and medicinal plants for health and veterinary care in rural areas.

Regulation needed

In the absence of a technically competent, transparent and accountable regulatory system, adoption of agricultural biotechnology, which has environmental, health and socio-economic implications, is not advisable in poor countries.

The adoption of regulated technologies like agricultural biotechnology may not be difficult where regulatory systems can be established

and enforced easily. This is not necessarily the case in developing countries where there is a deficit of skilled manpower and finances to run a stringent regulatory system.

To develop new technologies relevant to the poor, the public sector must step up spending to create accessible and affordable public goods. International research and development agencies must support such efforts and intervene in the creation of novel approaches to deal with innovation and intellectual property (IP) so that new technologies do not remain shackled in patents, available only to the rich. Countries should develop sensible domestic IP policies incorporating equity and justice.

Dr Suman Sahai

is President of the Gene Campaign in New Delhi, India
genecamp@vsnl.com

1. M. Leach and I. Scoones, *The Slow Race: Making technology work for the poor* (Demos, 2006). See <http://www.demos.co.uk/catalogue/thelowrace/>

Intelligent design

Rachel Ankeny asks: Why is such junk science so popular?

Intelligent design is junk science. But its success in being heard illuminates our understandings and expectations of science.

Today's proponents of intelligent design are not biblical literalists. They often remain agnostic as to what or who the designer might be, and clearly do not hold that the universe was created in six days, that the Earth is only 10,000 years old or that the fossil record was deposited during the flood in Noah's time. Neither do intelligent design theorists reject the notion that some evolutionary change has occurred during the history of life on Earth.

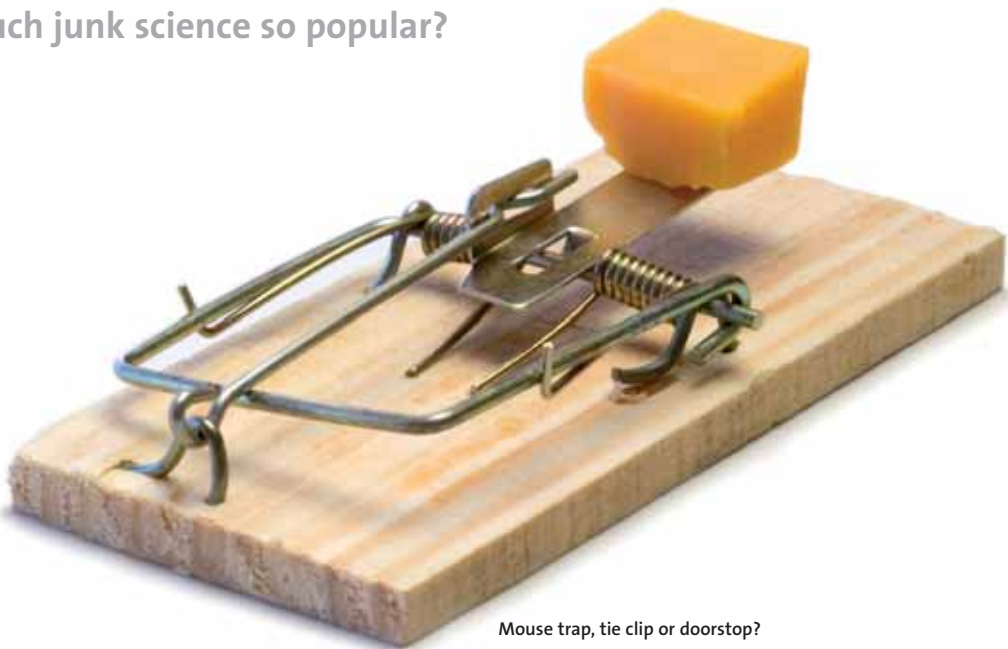
The intelligent design movement's primary claim is that living organisms are too complex to be explained by any natural causes or 'mindless' processes. Instead, the design we find in organisms can be accounted for only by invoking a very clever designer of indeterminate nature. They rely on a series of examples, such as the human eye, to illustrate the idea that it is extremely difficult to imagine how complex organs and organisms could have arisen simply through evolution.

Traps

For instance, one of intelligent design's main scientific advocates, the biochemist Michael Behe, focuses on the idea that cells are complex not just in degree but in kind, as they contain structures that he claims are irreducibly complex. Behe typically provides the simple example of a mouse trap.

They argue that it is extremely difficult to imagine how complex organs and organisms could have arisen simply through evolution

A mouse trap has a number of different components: a base, a spring, a catch, a hammer and a bar to hold down the mouse. All of them have to be present in the right place for the mouse-trap to function. If you remove one piece, it isn't the case that the mouse-trap works less well; it simply doesn't work. So, if you consider even relatively simple biological structures such as the



Mouse trap, tie clip or doorstop?

bacterial flagellum, you find that 30 to 40 different proteins are required in a particular arrangement for the flagellum to motor around. Since the flagellum needs all its parts to function, it is impossible to imagine it having been built up via gradual mutations combined with selection. Behe thus argues that irreducibly complex cells arise in the same way as irreducibly complex devices such as mouse-traps: they must have been designed by someone.

As logical as this argument seems, it fails to consider that perhaps indirect paths to outcomes could explain them. Extremely elaborate natural structures may be produced and selected over time, for various reasons that change with environmental and other factors, and later prove to be well adapted for yet other reasons. A mouse trap missing some of its parts might be useful as a tie clip, and the base of a mouse trap on its own could be useful as a doorstop.

Critics ignore complexities of science

If intelligent design relies on weak arguments and analogies, why has it been relatively successful in the past few years at getting a serious airing? Its success points to a critically important issue facing us today: our understandings and expectations of science.

Even relatively robust critiques of intelligent design often fail to convince us because they do not capture the actual complexities inherent in scientific theory and practice.

For instance, consider the frequent claim that the theory of evolution by natural selection has been conclusively proved. This sort of argument reflects sloppy language and reasoning that even an undergraduate student of the philosophy of science would immediately recognize. Most accounts of scientific success hold that no theory can ever be conclusively proved or verified. Our best theories are those that provide explanations of key phenomena that were not provided by earlier, competitor theories. Scientific theories must be capable of being checked against positive evidence through having testable consequences, and hence can be proved wrong (or falsified). The core concepts in the theory of evolution by natural selection have not been cast into doubt as new evidence has been gathered.

This argument fails to consider that perhaps indirect paths to outcomes could explain them

In contrast, critical problems arise when one attempts to assess the theory of intelligent design using these principles. It presupposes an invisible causal element that is, by definition, not detectable – the intelligent designer – to explain the observed natural world, an element that cannot be rigorously assessed using the usual scientific methods.

Even if the theory of evolution by natural

@ a glance...

Proponents of intelligent design rely on weak arguments, yet have a serious airing

Critiques of intelligent design often fail to capture the complexities inherent in scientific theory and practice

The popularity of intelligent design underscores disquiet in society about our relationship with science

When much science is failing to live up to its promises, intelligent design seems to give us simple answers

We need to make intelligent choices about what to believe and whom to trust

selection were shown to be false, the next best contender would not be intelligent design. But those who argue against intelligent design often assume that those they are trying to persuade are not clever enough to make these sorts of distinctions, and instead rely on an impoverished, polarized view of what science is; leaving evolution by natural selection woefully vulnerable to criticism.

Successful science must engage the public so we can make intelligent choices about what to believe and whom to trust

Science is failing cultural needs

At a deeper level, the recent popularity of intelligent design underscores disquiet in society about our relationship with science. For many, science has become our modern, secular saviour, giving us direct access to the cosmos and the mysteries of life. But more recently, science has become inaccessible and distant. Increasingly, we must rely on experts to tell us what to believe, and have stopped thinking and making judgements about what counts as good science.

In addition, our often blind faith in science has been shaken. The pay-off from promissory notes about the miracles of science, particularly medicine, seems distant indeed: the war on cancer seems less likely to reach a satisfactory end any time sooner than the Iraq conflict. For some, the increasing commercialization of science has changed it from a unique, knowledge-seeking activity, to merely another big business. It is not surprising that we search for options and choices, particularly in our market-driven culture.

We are often encouraged to think of

religious faith in polar opposition to science: to be truly rigorous and scientific, some claim (often implicitly) you must be an atheist. This type of fundamentalism is unappealing to many, who turn away from science in search of some meaning. Once again there is a deep cultural need that has been recognised and exploited by those who wish to promote intelligent design, and which often is not fully appreciated by its critics.

Something to trust

It is important that we begin to develop more critical attitudes towards science that are grounded in good philosophical principles as well as realistic ideas about what science can give us and how it evolves over time, even sometimes being shown later to be wrong. Intelligent design is not just bad science; it is pseudoscience or junk science. But it is powerful precisely because it seems to give us answers that are simple. Its advocates have been politically and culturally savvy enough to make certain it is compelling to the average listener, not just to those who can follow research articles in *Nature* or *Science*.

Intelligent design does not have an empirical research programme. Its scientific supporters have not published data in peer-reviewed journals. It fails to exhibit the hallmarks of what makes a field or theory scientific. But its advocates in Australia provide a free video featuring trustworthy people in white coats, an authoritative narrator and clear, accessible examples to support its claims, something that often is lacking even in the best science documentaries on television.

Science cannot merely be what scientists say it is: science requires public support not only for its financing but for its very survival. But in an era when we all need something to trust, much science is failing to live up to

its promises. Intelligent design provides an important lesson: successful science must engage the public – starting in the school classroom – so we can all make intelligent choices about what to believe and whom to trust.

Dr Rachel A. Ankeny
is at the School of History and Politics
at the University of Adelaide
rankeny@science.usyd.edu.au

This is an edited version of an article which first appeared in the *Sydney Alumni Magazine*

Science and slavery

Linda Strausbaugh celebrates a project to mark the 200th anniversary (in 2007) of the end of the Atlantic slave trade

Venture Smith, born free in Africa, was sold into slavery when he was about eight years old: 'I was bought on board by one Robert Mumford ... for four gallons of rum and a piece of calico, and called Venture on account of his having purchased me with his own private venture.'^{*} He was sold to a New York family, and married another slave, Meg, when he was about 22. He was known for his stature and strength, and his refusal to suffer insult resulted in his being sold several times. In

his late 30s he managed to buy his own freedom for seventy-one pounds and two shillings. Bit by bit he liberated his family, buying Meg in his early 40s. He died at the age of 77.

When he was 69, he said: 'Though once straight and tall, measuring without shoes six feet, and every way well proportioned, I am now bowed down with age and hardship. But amidst all my griefs and pains, I have many consolations; Meg, the wife of my youth, whom I married for love

and bought with money, is still alive. My freedom is a privilege which nothing else can equal. I am now possessed of more than 100 acres of land, and three houses. It gives me joy to think that I have and that I deserve so good a character.'^{*}

^{*} Excerpts from *A Narrative of the Life and Adventures of Venture, A Native of Africa* by Venture Smith
See <http://docsouth.unc.edu/neh/venture/venture.html>

Venture Smith's *Narrative*, published in 1798, is an extremely rare autobiographical window into one West African's encounter with the Atlantic slave trade during the eighteenth century. It also vividly recounts the extraordinary challenges Smith overcame to free himself from slavery and to live as an American citizen.

Born Broteer Furro around 1729 in West Africa, Smith died in Haddam Neck, Connecticut, in 1805. By the time of his death, Venture had become a highly respected merchant and landowner.

A unique interdisciplinary project, *Documenting Venture Smith*, is now trying to trace the geographical and ethnic origins of Venture and his family.¹

Looking back

The genome offers an unparalleled opportunity to trace the footprints of history. By comparing DNA signatures of any individual with those of living populations, we can make inferences about the geographical/ethnic origins of our ancestors. Thanks to the many descendants of Venture Smith, who are active partners, and the

philanthropical sponsor Bio-Rad Laboratories, such studies are under way.

Documenting Venture Smith hopes to 'look backwards' from the remains of Venture and Meg, his wife to better understand their geogenetic origins. At the request of the matriarch of his living descendants, an attempt was made in summer 2006 to recover DNA from bones collected from the excavated graves of Venture, Meg, their son Solomon and granddaughter Eliza. Unfortunately, the acid soil and water had long ago dissolved all skeletal elements, except two badly degraded arm bones from Meg. DNA recovery attempts are ongoing.

Looking forwards

There can be little doubt that the slave trade has had a major impact on the modern genetic landscape of many parts of the world. The second part of the genomics perspective is to 'look forwards' from Venture and Meg, through their living descendants, to document the many new lineages that contribute to the modern genetic landscape arising from this remarkable couple.

This pioneering study is made possible by

excellent genealogical records compiled through a collaboration between many descendants and one member of the East Haddam Cemetery Association who has been following the trails of Venture's family for years. By analysing the mitochondrial DNA types of descendants from two branches of Venture and Meg's family tree, we have found evidence of maternal lineages tracing back to Africa. The first dates back 80,000 years, and ties Venture's descendants to one of the oldest modern peoples who left Africa to play a role in populating the rest of the continents. The second maternal lineage detected through the Smith descendants dates to 59,000 to 79,000 years ago, to a people who now make their home in western and west central Africa.

One can't help but suspect that entrepreneurial Venture would be pleased that his life's story is reminding us that the struggles for freedom, equal rights and human dignity are not confined to one point in time.

1. *Documenting Venture Smith* is a partnership of the University of Connecticut, the Beecher House Center for the Study of Equal Rights and William Wilberforce Institute for the study of Slavery and Emancipation (WISE, University of Hull). A full report of this project will be delivered at the May 2007 WISE conference *Slavery: Unfinished Business* at the University of Hull.



The science team by the gravestones during the excavation. Florence Warmsley, a descendent of Venture and Meg Smith, is on the right, talking to Linda Strausbaugh John Spaulding, *Friends of the State Office of Archaeology*

Dr Linda D. Strausbaugh
is Professor of Genetics & Genomics
and the Director of the Center for
Applied Genetics and Technology at
the University of Connecticut
linda.strausbaugh@uconn.edu

Science teaching in schools

Lord Broers summarizes his findings

Effective science teaching in schools is essential, both for ensuring a satisfactory degree of scientific literacy in society at large, and for equipping the next generation of scientists and engineers to progress into higher education and beyond.

However, there is no consensus on what effective science teaching looks like, nor on how it can best be achieved – as illustrated by the recent impassioned debate over the new GCSE science syllabus. Nonetheless, the consequences of inaction could be dire. As the new SCORE science partnership warned, ‘the next generation of scientists could be lost if urgent, concerted action is not taken.’¹

The House of Lords Select Committee therefore agreed that this would be an appropriate time to conduct a follow-up inquiry to our earlier report, *Science in Schools*. In particular, we were keen to show how the examination system could be improved and how science teaching could be enhanced and enriched, thus encouraging more students to opt for the sciences and mathematics. We also wanted to consider the recruitment and retention of teachers.

Syllabus and careers

In the course of our inquiry, we found good evidence that students were opting for ‘easier’ A-levels over the sciences and mathematics. This problem was compounded by the fact that students were being forced to study an excessively narrow range of subjects at too early an age. We concluded that a broader-based syllabus for post-16 students would result in students receiving a more rounded education, ensuring that they would not be forced to over-specialise before seeing the merits of pursuing science and mathematics beyond GCSE. Accordingly, we called on the government both to revisit Sir Mike Tomlinson’s proposals for a broader system of diplomas, and also to consider the increasingly popular International Baccalaureate.

We were also deeply concerned about the poor quality of careers advice being offered to students, which was having an adverse impact on the numbers opting for science and mathematics A-levels. The Connexions Service had proved incapable of fulfilling the needs of high achievers, and careers advisers overwhelmingly had humanities backgrounds which often made them ill-suited to advise on

STEM (science, technology, engineering and mathematics) careers. We urged the government to take decisive action in this area, at the very least by honouring their pledge of support to the proposed ‘Careers from Science’ website.

Teaching methods

Turning to the way in which science and mathematics are taught, we were concerned about the increased incidence of ‘teaching to the test’, whereby the nature of the national curriculum tests and the pressure for students to score well were pushing teachers into narrow and uninspiring teaching methods. We therefore called on the government to alter the current testing regime so that the tests assessed a much broader range of skills, thus allowing teachers greater flexibility to inspire students in the classroom.

We also urged the government to take prompt action to secure the future of practical science in schools. In particular, we favoured a central website on practical science to help address health and safety fears. We also recommended the introduction of a proper career structure and improved pay for school science technicians, who continue to be undervalued in spite of the crucial role they play.

Recruiting more teachers

Effective science and mathematics teaching is impossible without suitably qualified and inspiring teachers. Unfortunately, there is a serious shortage of specialist physics and chemistry teachers. We concluded that this issue could only be tackled effectively if schools were given more freedom to offer significantly higher salaries to candidates with specialist qualifications in these subjects: market forces cannot be ignored.

We also called for the government to offer longer-term incentives to science and mathematics teachers, by reducing the size of the golden hellos and instead offering to write off student debts in return for four or five years’ service. Finally, we called for a better-paid and faster route for those people with substantial expertise of science or mathematics in industry to gain qualified teacher status.

Subject-specific continuing professional development (CPD) is essential for science



Specialist science and mathematics teachers should be paid ‘significantly higher salaries’ *Rolls-Royce plc*

teachers in particular, because the subject is constantly evolving. We therefore recommended that the government make it compulsory for teachers to undergo a certain amount of subject-specific CPD each year. We also called for additional ring-fenced money to be allocated to schools, in order to cover the cost of supply teachers standing in for staff on external CPD courses.

Constructive blueprint

Ultimately, we felt that the government were approaching the problems facing science and mathematics teaching with admirable determination. However, there remain many challenges and our report provides the government with a constructive blueprint for the future of science and mathematics in schools over the coming years.

1. See <http://www.royalsoc.ac.uk/news.asp?id=5215>

The full report is available at www.parliament.uk/hlscience

Professor the Lord Broers
is Chairman of the House of Lords Select
Committee on Science and Technology
hlscience@parliament.uk

Good Work in turbulent times

Helen Haste hears from Howard Gardner



Howard Gardner: dilemmas of ethical responsibility
Jay Gardner, 2003

American psychologist Howard Gardner sees an ethical crisis looming for US scientists.

First, he sees pressures from the increasing role of the market in the patenting of many scientific developments. Second, he finds that young researchers, even in top flight institutions, are driven by the desire to make money, and they feel they can only afford to address ethics after they have made it. He recently spoke to the Scottish Parliament about his current studies on 'good work' – what makes for responsibility and ethical awareness in the professions, and how to inculcate this quality in young people.

Some scientists were rather naive about the forces that would keep their field on track ethically

Gardner is a renowned psychologist, recipient of a MacArthur 'Genius' award, who initially established his international reputation through his work on multiple intelligences and creativity. He holds a Chair at Harvard Graduate School of Education. The *Good Work* project, which he co-directs with William Damon of Stanford University, and Mihaly Csikszentmihalyi of Claremont Graduate University, asks what it takes to do good work in difficult times. It interviewed over 1200 top US professionals in nine fields, ranging from genetics and medical science to

law and journalism.¹ A parallel project has been carried out in Denmark.

Scientists' perceptions

Gardner says: 'There are three ethical issues that concern scientists. Two are uncontroversial – going about one's work in an ethical and open way, and being a good citizen in general, participating in the community. The third is more problematic; how far should one feel obliged to take responsibility for how one's work is used?' He cites a personal example. He discovered that, in Australia, his theory of multiple intelligences was being used in education to differentiate people along ethnic lines. He had to decide whether to speak out publicly. He concluded he did have that obligation, and this made him aware of the ethical dilemmas that many scientists should, in his view, face up to.

However, many of the geneticists in the *Good Work* study did not see this kind of responsibility as their role, and they also were optimistic that there were sufficient institutional checks and balances in place. 'It is notable that, in general, journalists and lawyers are very interested in the implications of our *Good Work* project, and so are some medical scientists, but geneticists on the whole aren't,' says Gardner. 'Amongst the scientists we interviewed, some were heavily involved in social and ethical issues, but many others were rather naive about the forces that would regulate their field and keep it on track, ethically.'

He regards it as a matter of urgency that young scientists are exposed to ethical issues as part of their training, but this shouldn't be through 'a module which no-one takes seriously'. He believes that a good method – that he would like to see implemented in US colleges – is to require students to have a summer's internship, working in someone's lab, where ethical issues would arise naturally and could be addressed.

National differences

There are differences between the US, and the UK and Europe, in the nature of current ethical debates. One difference lies in the laws on patenting biological developments, which in the US are more liberal than in many European countries. This also means that

many – perhaps most – top US scientists work simultaneously in the university and in the corporate world; many of the *Good Work* respondents did not see a conflict of interest between these worlds.

Another difference is that in Britain, there has been much public discussion about ethical issues, for example over GMOs, animal rights and BSE, none of which touched the US to anything like the same extent. Gardner sees this making ethical debates much more explicit in Britain, where scientists cannot ignore them so easily.

Recent pressures have brought religious forces into the US arena, around stem cell research, evolution teaching and other areas, which are not present in the UK. Combined with increasing pressures on financial support, and increased competition, Gardner foresees many young US scientists leaving the country for more supportive environments.

The key question is how we can create responsibility in work

All professions

The *Good Work* project is about laying foundations for preparing people for all professions, not only science; but the sciences are particularly salient because ethical issues have been traditionally less explicit there than in medicine, law or journalism, for example. As Gardner says, 'Good work is work that is excellent, ethical and engaging – and what makes people want to do such work? We live in turbulent times when our sense of time and space are being altered by technology and where market forces are very strong, without much to counter them. In this context, the key question is how we can create responsibility in work.'

1. See goodworkproject.org

Helen Haste
is Visiting Professor at the Harvard
Graduate School of Education and
Professor of Psychology at the
University of Bath
helhaste@aol.com

Donor conception in Victoria, Australia

Information is available to all parties, explains Louise Johnson

The Australian state of Victoria is the only jurisdiction in the world where egg or sperm donors can apply for identifying information about the children their gametes helped to conceive.

This information can only be provided with consent from either the parent recipients (if the child is under 18 years) or the young adult on reaching 18 years.

In Victoria, legislation passed in 1984 and enacted in 1988 means that 18 year-olds who were conceived using donated sperm or eggs can also seek identifying information about their donors, if the donors consent. Parents can also apply for information about the donor of their child if their child is under 18 years.

The first cohort of young people to whom the relevant legislation applies is turning 18 this year.

About 100 children turn 18 before December this year, and 200 will turn 18 next year. All applications for identifying information are made to the Infertility Treatment Authority (ITA), an independent statutory authority that regulates the provision of assisted reproductive technology in Victoria. The ITA manages all registers relating to donors and children born using donated sperm or eggs.

Research conducted by the ITA has told us that parents do want to tell children of their origins, but are afraid or unsure how to do it. Young adults also tell us that it is crucial to be able to obtain information about their donor, and that this is an important part of the identity jigsaw.

Education campaign

We believe that, in Victoria, only between 30 and 50 per cent of donor-conceived children know the facts surrounding their conception. Now, young adults may find out about their conception if contacted by the ITA, following a request from a donor for identifying information. This potential problem highlighted the need for a major education campaign.

The three-year public education campaign, *Time to Tell*, was implemented to help families manage the impact of this legislation. The *Time to Tell* campaign encourages families with children born using donated sperm or eggs, to consider the issues and the benefits of telling their child how they were conceived.



All will be revealed

Early results indicate that the campaign is reaching the target audience. From its launch in May this year to the end of August, 83 parents, young adults, donors and relatives have sought information and support via telephone or email, and 11 people have received counselling.

Donors have received support on how to tell their families about their donations. Several parents in the target audience have reported that telling their children that they were donor conceived, was a positive decision. Some parents have made the ITA aware of their decision not to tell their children they are donor conceived, so that any inquiring donors can be advised that the child is unaware of their origins. This can be taken into account in the donor's decision-making about whether to proceed with an application for identifying information.

Impact on donors

Australia-wide guidelines state that clinics can only use donors who consent to identifying information being available to children born as a result of their donation. Donors are counselled about the implications of the legislation before they donate sperm or eggs.

Victoria's legislation, under which the identity of donors could some day be sought, has had some impact on the number and type of donors. However, the number of donors in Victoria had declined before the legislation was introduced. Numerous factors had come into play, for example, the introduction of ICSI

(intracytoplasmic injection) where the sperm is injected directly into an egg, meant that couples could receive infertility treatment without needing to use a donor.

An analysis conducted by the ITA indicates that, when legislation was introduced that strengthened the rights of donor-conceived children to receive information on turning 18 years about their donor (donors consented to this for the first time in 1998), the number of donors dropped that year and in 1999. However, slight increases were noted in 2000 and 2001. The impact of the legislation was greater on sperm donors than on egg donors. This is not surprising, as egg donors were often known by the recipient parents.

Donors now tend to be more mature, often having families themselves. An increasing number of donors in Victoria meet recipient parents before conception takes place, and take into account that contact with future offspring may occur. Recipient parents as well as clinics are often involved with the recruitment of donors.

Concern for the child is what underpins the legislation and the work of the ITA, and it will remain a priority for us.

Louise Johnson
is Chief Executive Officer of the
Victorian Infertility Treatment
Authority, www.ita.org.au
ljohnson@ita.org.au

Biofuels: entangled in a policy thicket

Jon Lovett picks over the prickles

The technology now exists to convert biomass into fuel, thereby bypassing the lengthy geological process of forming oil from vegetation.

Biofuels cover a range of products: from ethanol, which can be readily made from fermentation of sugars in brewing, to biodiesel, which is derived from vegetable oils or animal fats.

Expanding the use of biofuels to power transport in Europe would bring us many benefits. These include carbon savings to help limit global warming, enhancing security of our energy supplies, encouraging rural economic productivity and providing an export market for developing countries.

However, policies which subsidise biofuels inevitably introduce skew into the market, and these can create problems.

Advantages of biofuels

We need biofuels in Europe for two main reasons. First, security of supply. 98 per cent of the transport market is dependent on oil. If nothing is done, external energy dependence will reach 70 per cent before 2030, with 90 per cent external dependence on oil. Liquid biofuels provide the only direct substitute for oil.

Second, road transport generates 85 per cent of the transport sector's CO₂ emissions and CO₂ has been linked to global warming. Biofuels will provide marked reductions in carbon emissions. They will also revitalise the European agricultural sector and provide an important export for developing countries.



Technology needs policy to promote biofuels

European policy

European policy makers have responded to the issues by passing European Directive 2003/30/EC of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport.

The Directive paints an attractive picture of the potential that biofuels offer. To move the use of biofuels forward, the Directive set targets. Biofuels and other renewable fuels should make up 2 per cent of all petrol and diesel by 31 December 2005, with the proportion rising to 5.75 per cent by 31 December 2010.

Policy into practice

However, the problem is that biofuels are more expensive than oil and the UK has not met the 2 per cent target. In Europe, only Germany and Sweden have met the target. These two countries got their biofuels programme off the ground early by implementing legislation in the form of tax exemption for biofuels, requirements for fuel suppliers to include biofuels in their products and the use of greener vehicles within government transport fleets. This meant that both countries had an established production and supply chain for biofuels before the EU Directive came into force.

This doesn't mean to say that the UK government isn't active. In 2004 the UK Energy Act became law, and granted the government primary powers to introduce a Renewable Transport Fuel Obligation. An RTFO scheme could have varying layers of complexity; from an obligation to simply supply a biofuel mix, to trading of Renewable Transport Fuel Certificates, to paying a buyout price rather than supplying the fuel. Of course, the more complex the system, the more expensive it is to administer.

So, rather than moving towards a market in which biofuels compete effectively with oil, the future costs of global warming are having to be internalised by the dead hand of government regulation.

Policy measures could include eco-labelling; price differentiation through emission charges and product levies; environmental quality promotion through education; tradable permits; environmental performance bonds, funds and environmental risk assessment in banking procedures; tax

exemptions for vehicle fleets and a review of the Common Agricultural Policy, which is something of an ongoing and politically charged process.

Policy measures could include eco-labelling; price differentiation through emission charges; environmental quality promotion through education; tradable permits...

Pros and cons

If the money was right, we could do it physically.

About 17 million hectares of EU agricultural land is needed to meet the Directive's objective entirely from domestic production; this is from a total of 97 million hectares. In addition, 35 per cent of the annual growth of wood in EU forests is not used, and could be used for biofuel. Countries such as Bulgaria and Romania, due to join the EU in 2007, have abundant agricultural land.

But our agreement with the World Trade Organisation means that we cannot create a 'Fortress Europe' against biofuel imports, and growth of biofuels could be an important source of income for developing countries. On the other hand, whilst this might be an economic boon to developing country agriculture, it has also raised concerns about biodiversity loss and replacement of food crops.

While there are many benefits from expanding the use of biofuels in Europe, the policies we need to get us there create their own practical difficulties. The way forward is to combine the technical solution of biofuels with insights gained from economic and social analysis of the impacts that a shift to biofuels will have.

Dr Jon Lovett

is at the Centre for Ecology, Law and Policy at the University of York
jl15@york.ac.uk

Taking the guesswork out of travel

Stephen Ladyman goes data mashing

Technology is vitally important to modern transport – and the use of real-time and archived data is helping to transform the way transport is planned and managed in the 21st century.

Rapid advances in processing are not only producing greater amounts of data, but also enabling the resulting information to be acted upon more effectively.

Over the past decade, for example, these advances have led to the introduction of smart card transport payment systems, the successful London Congestion Charge, and increasingly affordable satellite navigation units for cars.

Transport Direct

The Department for Transport (DfT) achieved a world first with the development of Transport Direct – an internet service that enables travellers to plan door-to-door journeys anywhere within Britain across different modes of transport.

The data come from more than 100 individual sources. To provide accurate information on bus connections across the country, for example, it was necessary to survey more than 330,000 bus stops, allocating a unique name and number to each one. A similarly exhaustive approach was applied to rail stations, airports, ferry terminals, taxi ranks and other transport locations.

To monitor congestion, the Highways Agency is using data from satellite navigation systems, traffic cameras and motorway detectors that control speed-limit signs.

Data mashing software

The Department has also been helping

develop software that brings together transport, economic and social data from many different sources to inform the planning of local services, including transport, and help ensure that more vulnerable members of the community can access local services.

Imagine a place with two hospitals. If one is closed, people living around it will have longer journeys to the remaining one. Accession software will enable the local authority to mine data from public transport data, maps (Ordnance Survey) and from the census (Office of National Statistics) to see, for example, how many people aged 65 or more will have longer journeys from where they live. They can then plan a new bus route which will be convenient for those people, to take them to the remaining hospital.

In future, new data technology will help take the guesswork out of travel. For example, it will be able to provide us with the exact location of buses and trains via our mobile phones. Instead of waiting at bus stops or stations, we would be able to time our arrival to coincide with transport services.

Or we might want more sophisticated information. If we were going to meet a friend, the system could offer us different options – for example based on how quickly we needed to arrive, or how much we wanted to pay for tickets.

Many of the potential benefits offered by new technologies can only be realised if data is combined or ‘mashed’ with information from other sources. The development of more sophisticated and easy-to-use software is helping to remove technical barriers to data mashing applications. Such initiatives are no longer the exclusive reserve of the

big IT companies or university research departments. Instead they can involve a highly diverse range of groups from the public, private and voluntary sectors.

Data Grand Challenge

Because of our experience with data technology, the DfT is leading work on the Science and Innovation Ministerial Committee’s Data Grand Challenge. As part of the challenge, we are exploring ways of working with non-government sectors to improve data mashing and associated applications even further.

However, successful mashing requires a degree of experimentation with data that can be very difficult to access. The current obstacles should not be underestimated. They include intellectual property rights, problematic administrative procedures, a complex regulatory framework and commercial barriers to data access.

While government is not necessarily best placed to deliver new information services or applications, it can help to remove such barriers.

Making data available is not cost-free but, as work progresses on the Grand Challenge, I look forward to proposals that will improve access to data from a wide range of government sources.

Of course, government has a vital duty to perform as a regulator of public and private sector use of data. It is essential that we do not lose sight of the genuine concerns that people have about how data is used and the information that can be obtained from linking data.

In the future we can expect more powerful, flexible and user-friendly technologies to make travel more effective and efficient – for example pay-as-you-drive insurance, and faster, easier transport ticketing systems.

With such rapidly-growing potential, this is a fascinating sector in which to be involved – and we look forward to realising some of that potential in future through the Data Grand Challenge.



In future, we won't have to go to the bus stop to know when the bus will come

Dr Stephen Ladyman
is Minister for Transport
stephen.ladyman@dft.gsi.gov.uk

Consulting on research into ageing

Michele Corrado reveals what the public wants

The number of elderly people in the population is predicted to rise over the coming decades. This is partly due to the post-war baby boom generation reaching retirement age, but also to life expectancy for men and women being predicted to increase. This general trend can be seen right across the developed world. The statistics are striking.

In Britain, the Treasury has identified ageing as a key priority. By 2031, a quarter of the population will be of pensionable age, compared to just 14 per cent in 1951. And by 2050, life expectancy for men is expected to be about 80 years, compared with around 76 years in 2001. For women, it is predicted to be around 84 years, compared with 80 years in 2001. At the same time, the number of younger people is projected to fall slightly.

How does the current population feel about this? And what types of scientific research does the public feel should be undertaken in order to prevent diseases and conditions associated with ageing?

Consultation

This spring, Ipsos MORI undertook a general public consultation into ageing and scientific research into ageing, on behalf of the Biotechnology and Biological Sciences Research Council (BBSRC) and the Medical Research Council (MRC).¹ It comprised three general public workshops, followed by a large-scale, face-to-face quantitative survey among a representative sample of over 2,000 UK adults.

The outcomes of this work are helping the BBSRC and MRC to develop their strategies for research into age-related conditions.

Public priorities

In the workshop discussions, most people viewed ageing fairly pessimistically – in terms of a deterioration in health, rather than a natural life process. It is perhaps not surprising then, that there was huge endorsement (90 per cent agreed) in the quantitative study that research into ageing is vital to increase understanding of how quality of life can be maximised as people get older.

The findings also reveal far-sightedness on the part of the public. Preventing ill-health, and not cure, is the public's single most important area for research into ageing. More than twice as many UK adults chose research into prevention over research into cure.



Ageing: the public wants research into preventing ill-health

Second to prevention, and ahead of cure, came research focused on managing conditions, and how best to support and care for people who have ill-health. This perhaps reflects public awareness of the huge responsibilities involved in managing ill-health and medical conditions, and of providing support and care for such people.

Public preferences for allocation of research funds reveal that improving quality of life is the public's most important criterion. Also of importance is the need to provide benefit for the greatest number of people in the allocation of research funds (an indication of altruism), as well as prevention and cure. Another factor influencing decisions included managing the effects of old age. Value for money was mentioned by far fewer, as was scientific excellence – perhaps because the average member of the public is likely to know little about scientific excellence or, as was indicated from the qualitative research, the public assume excellence is a prerequisite for funding.

Public attitudes to consultation

We know from our earlier work at Ipsos MORI for the Office of Science and Technology (now Innovation)² that eight out of ten UK adults support public consultation on scientific development, and are keen for consultation to be followed by action on the outcomes. A duty therefore lies with scientists, the media, policy makers and funding bodies to communicate the outcomes of scientific research, in this case on age-related conditions.

But when the public says they favour consultation, what do they actually mean? And is public engagement engaging the

public? This was the title of the Wellcome Trust's *Engaging Science* conference which I addressed earlier this year. There, I highlighted the fact that, from our work at Ipsos MORI, we find that the public is unlikely to be content with consultation for consultation's sake.

Many members of the public are cynical that, in the case of government consultations at least, results will not be listened to or acted upon. The public also says it wants to have more influence on decision making on science or scientific research that is conducted, than is currently the case.

We know from our qualitative work that different people want different degrees and types of involvement. Some simply want to be kept abreast of developments. Others want to attend meetings and sit on decision-making panels. And it is this desire for a range of types of involvement that, if responded to appropriately, is likely to further increase public engagement with science and its impact on society.

1. This consultation builds on an earlier Ipsos MORI one for the BBSRC and The Institute of Food Research, on diet and health. See www.ipsos-mori.com/polls/2005/bbsrc.shtml and <http://tinyurl.com/y4t82k>

2. OST/MORI Science in Society, 2004.

See www.ipsos-mori.com/polls/2004/ost.shtml

Michele Corrado
is Head of Medicine & Science Research
at Ipsos MORI Social Research Institute
michele.corrado@ipsos-mori.com

Are policy-makers interested in public engagement?

Alice Taylor-Gee and Nigel Eady hope they are

The need for better public engagement in policy decisions is widely acknowledged.¹ The 'hardware' required for engaging with publics – citizens' juries, focus groups, consensus conferences – is well known.

Through an innovative project called the community x-change, the BA has been focussing on trying to change the 'software' – the attitudes, values and principles within policy-making circles.²

Community x-changes

Public engagement is now *de rigeur* in the field of science communication, yet many questions remain. Do policy-makers have the capacity to engage effectively with participatory processes? Who defines the opportunities, subjects and framing of the issues the public are allowed to discuss? Do scientists get the chance to discuss science issues with their local community?

We wanted to provide opportunities for scientists and the public to engage through dialogue. We wanted to provide opportunities for citizens to discuss issues involving science. As well as this, we hoped to improve dialogue practices, particularly those allowing excluded voices to inform policy; and to improve the way communities and decision-makers become involved with each other. We also wanted to develop policy makers' capacity to engage with participatory processes.

The community x-changes are running over three years in three different locations. In the first year, based in East Anglia, the project has set out to provide a space for a diverse group of people to discuss climate change, amongst other issues. We held a series of structured deliberative workshops where citizens, including scientists and policy makers, met to share their opinions and strategies for positive change.

Workshop participants

The workshops applied a 'two way street' approach, pioneered by our partners at PEALS (Policy, Ethics and Life Sciences Research Institute), Newcastle University, where participants could identify issues of local concern as well as discussing issues that were pre-determined. Past projects have shown that this leads to better commitment on all



Feedback at the x-change: participants discussed local issues

issues and a greater sense of ownership of the discussions.³

Involving people in public engagement exercises has many potential pitfalls. Time constraints can lead to a reliance on dominant community voices, obscuring and even misrepresenting genuine views. The community x-change process was therefore designed to include voices that are rarely heard. With this in mind, many of the participants were invited by linking up with local community and school groups. Alongside this, we used conventional approaches including direct mailing using electoral roll data.

A cohort of scientists also actively contributed to the process, as citizens. However, we excluded scientists with expertise in the area of climate change so there was less risk that citizens felt that the professional researchers knew all the answers. The main issues to emerge from discussions were: improving public transport, encouraging schools to run eco-friendly initiatives, creating a space for the community to meet and reducing crime.

Policy-makers and key stakeholders have been involved and informed throughout the scheme. The outputs of the process have been shaped to fit the remit of those creating and contributing to policy, as well as providing the chance for policy-makers to hear the views of the panel face-to-face.

A new space

We have created a space for traditionally excluded voices to be listened to. We have engaged a number of members of the

community on scientific issues, and increased understanding of the kind of things that the panel may be able to do as individuals.

The results of the x-changes are being shared at a variety of levels. A DVD of the project, along with diaries of participants, was presented at the BA Festival of Science. The x-change participants are helping us design a resource for the 33 BA branches across the UK, as well as looking at how to press for the outcomes to be acted on in their region. This will act as a springboard for events all around the country, multiplying the number of people taking part in this project.⁴

Sharing the results of the process with policy-makers has, unsurprisingly, proved to be difficult. Dialogue activities seem most popular among policy-makers when they own them exclusively, rather than having to be answerable to the results of an independent process.

Even though relevant policy-makers were engaged early in the process it is hard, at this stage, to say whether this first phase of the community x-change will result in concrete changes. Through Sciencewise, a number of policy 'hooks' have been identified and there have been a number of fruitful discussions. The national roll out events, and our follow-up work with participants in East Anglia, provide a longer time-frame within which to embed our group's views and experiences within policy.

The community x-change is funded by Sciencewise, Defra and the Wellcome Trust.

1. See the Council for Science and Technology's (CST) report, 'Policy through Dialogue' published in March 2005 <http://www2.cst.gov.uk/cst/reports/#8>

2. See <http://www.demos.co.uk/publications/publicvalueofscience>, p.19

3. See www.nanojury.org

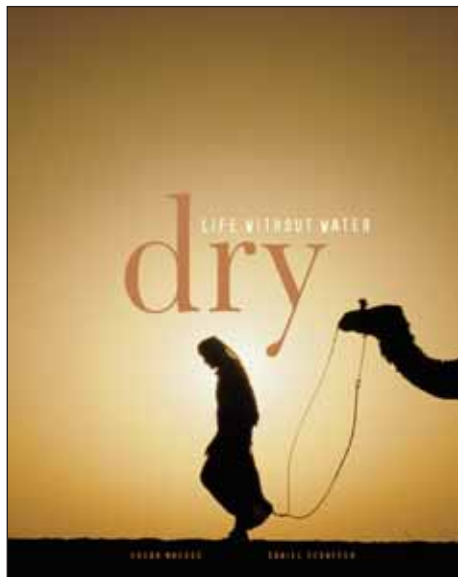
4. For more information see, www.communityxchange.org.uk

Alice Taylor-Gee
is Science in Society Manager at the BA
alice.taylor-gee@the-ba.net
Nigel Eady
is Science in Society Officer at the BA
nigel.eady@the-ba.net

Life in dry regions

Wendy Barnaby discovers it's sustainable

Dry: Life without water, edited by Ehsan Masood and Daniel Schaffer (Harvard University Press, 2006, ISBN 0-674-02224-6), 192 pp



The lives of people: rich and resilient

When I first opened this book, I didn't bother with the text. The pictures are stunning.

People tend cattle in Pakistan, water sheep in Nepal, drive donkeys in China, inspect rose petals in Oman, sort wheat in Morocco, weave wool in Jordan, shear vicuña in the Andes, grow trees in Burkina Faso, discuss camels in Sudan – and all against a background of these dry regions' stones, rocky escarpments, sand dunes and dusty plains. The book aims to highlight how people can live in dry and semi-arid regions while conserving biological diversity and using it sustainably.

Criteria for success

One billion people live in dry regions, which cover 40 per cent of the world's land surface. The productivity illustrated here has been helped along by aid from the world's largest environmental funding body, the Global Environment Facility (GEF). The book is not simply an advertisement for the GEF's projects, however. It points out that some of them have only led to temporary improvement, and one failed altogether when the foreign experts went home.

The second aim of the book is to filter out the features common to sustainable results

from GEF aid. The idea is to provide a checklist of criteria for success, which scientists and specialists in economic development and public policy could build in to subsequent projects. The editors have come up with six lessons.

Lessons learned

The first is that projects funded locally lasted longer than those which relied on external money. In part of the Thar desert in Pakistan, local people kept costs down by using donkeys, instead of mechanized transport, to build micro-dams in natural rock hollows. Drought is no longer the enemy; agriculture has taken off, enrolment has increased at primary schools.

Second, locals need to try to use modern science to benefit their communities. Camel herders in the Sudan have shown veterinary scientists how to track camels, so that the scientists can check and improve their health.

Third, successful initiatives need to revive or build on traditional knowledge. Moroccan farmers need a modern gene-bank to ensure that they never run out of seed. Moroccan women can identify favoured species because they know which soil best supports different species, and how crops are stored, transformed into food for humans and livestock, and sold.

Fourth, local heroes can provide leadership necessary to get projects off the ground. Mexican villagers living in poverty on the mountainous Sierra de Manantlán Biosphere Reserve are backing efforts of a trusted official, Sergio Graf, to improve their situation. He is proposing that the city people benefiting from the water which falls on the mountains should pay compensation to the villagers for maintaining the biosphere in a form which will go on delivering the water to the city. The villagers would be prohibited from cutting down trees or converting land for cattle grazing.

Fifth, projects need to learn from failure as well as celebrate success. When foreign scientists erected huge nets in Chile's Atacama desert, to collect the fog rolling in from the coast and convert it to usable water,

they harvested more than twice the village's daily water supply. However, the system fell into disrepair when the scientists left. Chilean experts are now designing fog-catchers which the villagers themselves will be able to repair.

Sixth: sometimes, you strike it lucky. Young railway workers were trying to find a way of stopping the sand burying new tracks in the middle of the Tengger desert in China. To pass the time, they played a game in which they made vertical walls and Chinese characters out of straw and wheat stalks, which they half-erected in the sand. These turned out to stop the sand much more effectively than the straw carpets brought in for the purpose – and 50 years on, lines of adapted straw tiles have protected the railway and greened the desert nearby.

Real lives

The book isn't perfect. The putative lessons learned from the 16 individually-authored stories don't always stand out from the texts themselves. Neither does the overall production of the book maintain the standard of the illustrations. The copy needs better proof-reading, and some of the pictures lack captions.

However, the stories are fascinating to dip into. This is the reality of development discourse: the lives of people with their needs, beliefs, constraints and possibilities. Water is part and parcel of all these things, and affected by them all. Above all, the illustrations make this an enchanting window onto the richness and resilience of life in dry regions.

Wendy Barnaby

is the Editor of *SPA*. She is the author of *Directing the flow: a new approach to integrated water resources management* (European Commission, 2006)
wendy.barnaby@the-ba.net

The Royal Society replies to Tom Wakeford

David Boak denies restricted access

Dear Tom,
I write in response to your open letter to Lord Rees (see p.29 of this issue).

The Royal Society received extensive national and international recognition for the consultative manner in which, together with the Royal Academy of Engineering, it conducted the nanosciences and nanotechnologies study in 2003/2004. The report was seen by many as a watershed in the way in which policy studies should be conducted. The methodology used in this study was developed from earlier work the Society had done in its Science in Society programme. As we indicate in the report to which you refer, the early years of the programme involved exploring different

methodologies and learning lessons from these trials. We acknowledge in the report that methodological approaches were improved as a result.

Our report, *The Impact and legacy of the 5 year Kohn Foundation funded Science in Society programme*, covers the final years of the programme and was not intended as an academic document. However, the University of East Anglia team to which you refer has submitted a paper for publication based on its evaluation of our 2002/3 dialogue programme. (An earlier report *Science in Society* (2004) examines the 2002/2003 period in some depth.)

As you know, PEALS (Policy, Ethics and Life Sciences Research Institute) was under

contract from the Royal Society to assist with the delivery of the 2002/2003 programme, for which you were paid a fee. The terms of that contract did not ban PEALS from publishing or disseminating any analysis of the Speaking Out workshops. And the notion that access to the reports of these meetings was restricted by some intellectual property arrangement is not borne out by the fact that they were available for a prolonged period of time on our website.

Dr David Stewart Boak
is Director of Communications
at the Royal Society
david.boak@royalsoc.ac.uk

Encouraging innovation for energy supplies

Martin Ince conducts a thought experiment

Vanessa Spedding is right to point out (SPA September 2006, p.8) that the UK's energy policy is at a fork in the road.

She might have added that most other countries in the developed world are similarly located, although not all have the added distraction of declining oil production as a factor in their energy equation.

Although I am delighted that a national debate seems to be taking place on this pressing topic, one disappointing aspect so far has been the contribution of the scientific community, and nowhere more so than in their thoughts on the possible revival of nuclear power. Scientists have tended to say that we have to have nuclear because they cannot imagine anything else. Maybe this just means that they are the wrong people to ask.

For a nuclear power station to get built, a commercial company will have to decide that it is the best use of its capital, in the teeth of evidence that many other energy investments pay back more, and faster. A community (probably near Sellafield) will have to accept this new neighbour. And, with time for

planning consent and construction, perhaps 15 years will have to evaporate before a light bulb is lit or a kettle is boiled.

These are serious objections, but what about another one, perhaps nearer to SPA readers' hearts? We all think that the UK has too few engineers and scientists. But reviving nuclear power will need thousands of them. The last time it was at its height, in the 1960s, the UK nuclear industry employed over 20,000 of these scarce creatures.

New thinking

Now try a thought experiment. Imagine that these people had not been asked to think up a new way to boil water, which is all nuclear power really is. Imagine that they had been asked to make Britain as energy-efficient as possible. They could have rethought buildings, machines, cars, aircraft, TVs, gas stoves; and of course the industrial processes used to make them and the materials they were made from. Can anyone doubt that this would have saved far more energy than nuclear power stations have generated?



Thinking energy efficiency

Although history never repeats itself, whatever the nuclear industry might hope, there is a chance that we are about to repeat this mistake. Nuclear power ties us in to getting electricity from a few big power stations feeding a national grid, a 20th century idea that may have run its course. It risks distracting attention from novel ideas such as nanotechnology-powered devices that can suck power out of small differences in ambient temperature and pressure.

Because British electricity is no longer supplied by the state, no government can announce that there will be new atomic power stations. But they can encourage genuine innovation – something else all SPA readers support – by announcing that there will not be any.

Martin Ince
is Contributing Editor of the
Times Higher Education Supplement
martin@martinince.com

Who's looking after public interest science in Britain?

Sue Ferns wants to know

As the union representing public sector scientists, Prospect is calling for urgent action to stem the loss of key research facilities and staff.

It may not be immediately obvious why we are so concerned. After all, public sector science has a record to be proud of and the government is not anti-science – far from it. Their commitment to the role of science and innovation in underpinning and driving economic growth is set out in the 10-year *Science and Innovation Investment Framework*,¹ and, since 1997, we have seen significant increases in expenditure on the science base, which we unequivocally welcome.

But good science doesn't always have commercial application. Science in the public interest is under threat.

Public science cuts

In the past couple of years, the government has closed world-leading institutes and programmes including research into breast cancer, chemicals in food, and animal diseases. Research on the impacts of climate change, pollution and biodiversity all face substantial cuts.

Staff remaining face uncertain futures, continual organisational reviews, and poor career prospects. No wonder then that morale

is low, and many scientists vote with their feet even before the axe falls.

Furthermore, our own investigations show that, once public research facilities close, less than one in four of the staff find alternative employment in scientific research anywhere in the economy. This represents a major loss of investment in highly qualified and highly skilled staff.

It also sends a very particular and negative message to students or university leavers who may be thinking about a career in science. The UK needs decent science pay and careers, otherwise highly marketable graduates will take their talents elsewhere.

It is an indictment of the continuing cycle of cuts and closures that, since the spring, Prospect has published three different briefings highlighting the difficulties facing various parts of the public sector science base.²

Who's looking after British science?, launched at a lobby of the Westminster Parliament in March, focuses on the research councils. *Who's looking after Scottish science?* formed the basis of a lobby of the Scottish Parliament in June, and focuses primarily on the research facilities funded by the Scottish Executive. *Who's looking after Defra science?*, published in September, highlights the valuable work of that department's science-based agencies.

Climate research cut

The message is clear: there is a strategic failure across government to take on the key responsibility of care for the national science base. We know that devolved decision-making is the fashion, but it is not appropriate in every case. In this context, it allows departments and research institutes to cut or close facilities on the basis of business cases that may make sense in the context of their own narrow remits, but have no regard for the wider implications or potential losses to Britain's core scientific capability.

One example is the decision of the Natural Environment Research Council in March to close four sites of the Centre for Ecology and Hydrology, despite widespread condemnation from across the scientific community. As a result, 40 per cent of the climate change research programme is being cut, and 20 per

cent will cease altogether.

Add to this the effects of complex, competitively-based funding arrangements that leave many research institutes with a low level of core funding from their parent bodies. It only takes a change in research priorities by one funding body to destabilise the entire organisation.

Finally, the government simply does not know how many scientists it employs, let alone their areas of expertise. It therefore cannot make any credible assessment of its own capability to meet future needs.

Charter for action

The upshot is that, at present, nobody can honestly answer our question: Who's looking after the nation's science? This worries us, not just because it directly affects our members, but because we genuinely believe that the nation's science base needs and deserves better care.

For these reasons, at the TUC (Trade Unions Congress) in September, Prospect published a *Charter for Public Science*³ setting out the actions the government needs to take to contain the mounting crisis in public science. The *Charter* calls for recognition of the crucial role played by science for the public good; decent pay and careers for staff, based on a better knowledge of existing capability; a halt to cost-driven lab closures and privatisation; and open decision-making. We also want a cabinet Minister with authority and accountability for public sector science, and a similar Ministerial role in the devolved administrations.

We will be working over the coming months to build a broad base of support for our *Charter* and to get an answer to our question.

1 See <http://tinyurl.com/58a8h>

2 All the briefings are published on Prospect's website at www.prospect.org.uk and are available in hard copy from Prospect HQ (Tel: 020 7902 6623).



'The nation's science base deserves better care'

Sue Ferns
is Head of Research and Specialist
Services at Prospect
sue.ferns@prospect.org.uk

'We were banned from publishing'

Tom Wakeford writes an open letter to Lord Rees, President of the Royal Society



Tom Wakeford

**Dear Lord Rees,
What a bold start you have had as the new President.**

The press have applauded the RS's criticism of Exxon Mobil, the oil corporation that values its shareholder dividends above what Al Gore calls 'an inconvenient truth' – human-induced climate change.

Your website lists Esso, UK subsidiary of the climate change-denying Exxon, as having been a valued 'benefactor...who has supported us as one of the leading scientific academies in the world' as recently as 2004. Exxon has not changed its views. It is a relief to see that, under your leadership, the RS responded to the growing environmental crisis by criticizing their distortions.

Science in society initiative

A deeper problem for the future contribution your academy seeks to make to the world is embodied by your Science in Society (SiS) initiative. Funded by a million pound Kohn Foundation donation, it has just published a report celebrating the end of its five year programme.¹

In 2002, your Society trumpeted its foray into this new realm with a quote from a leading SiS academic, Brian Wynne, who also sat on the advisory group. 'This new mood is not...about subjecting specialist scientific decision making to non-specialist votes or choices,' said Wynne. 'It is about helping scientists to engage in a mutually respectful way with non-scientists.'

Our hopes were therefore high when our team at PEALS started working in partnership with the SiS initiative a year later. Together we

designed a programme of workshops involving scientists and non-scientists, called *Speaking Out*.

Dialogue or PR?

While the PEALS team encouraged participants to use the initiative as exactly the sort of two-way conversation between specialists and the rest of us that most see as common sense, it was not clear whether the initiative was an RS public relations exercise or a genuine experiment in democratic dialogue.

Immediately after we had facilitated the final workshop, your staff wrote to government ministers, selectively quoting the conclusions reached by the workshops and thus making the RS's existing policies appear to be endorsed by the 'voice of the people'. No copies of these ministerial letters seem to have been sent to participants. We believe that workshop participants have a right to a say in how their voice is used in this context.

Arrogance

Despite many of its members being charming and well intentioned, we found the RS to be institutionally arrogant on at least three levels.

First, the reports produced by the scientists and non-scientists who took part as participants in the workshops were, we were told, the intellectual property of the Society. Second, when a group from the University of East Anglia (UEA) was commissioned to evaluate the *Speaking Out* workshops, its report remained a highly restricted internal document, rather than something to be published and discussed with peers.

Finally, despite our status as academic partners, we were banned from publishing or disseminating any analysis of *Speaking Out* without the permission of the Society. Yet your society proclaims openness, publication and peer review to be the cornerstones of reliable knowledge.

Rigorous scholarship

Science's interaction with society has been the subject of more innovative scholarship over the last ten years than almost any other area of social research. Your twenty-eight page report released this autumn¹ fails to cite a single piece of conventional academic literature. You thus miss out on the considerable depth of knowledge that the

rest of us have been trying to generate in recent years. This omission results in a glossy brochure that resembles the corporate spin that, in other contexts, you criticize.

What the report does reveal is the enormous turnover of RS staff within the SiS initiative. The UEA evaluation – the nearest the programme had to peer review – gave some clues to the causes of this haemorrhage of talent. I hope you, at least, are allowed to see a copy.

We found the Royal Society to be institutionally arrogant on at least three levels

Hardest battle

Other learned societies, the research councils, some medical charities and even government departments are slowly learning how to involve people in their decisions in new ways. Meanwhile, it seems doubtful whether some of your Society's work in this area even complies with the Council for Science and Technology's recent universal ethical code, as it does not respect the workshop participants' rights to have their voices heard.

Given what I know of your personal commitment, I suspect Esso's days as a Royal Society benefactor are numbered. But if you share my wish that non-Fellows should be treated as something more than ignorant saps, it seems to me that your hardest battles will not be with multi-nationals, but within your Society's own walls.

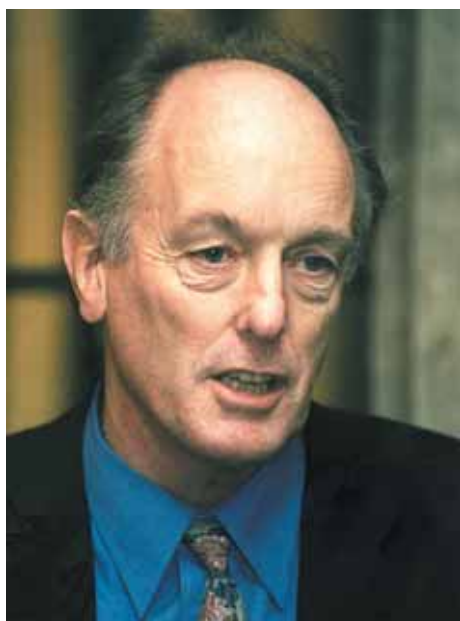
1 See www.royalsoc.ac.uk/downloaddoc.asp?id=3179

Dr Tom Wakeford
is Director of Co-Inquiry, PEALS (Policy, Ethics and Life Sciences Research Institute), Newcastle University
tom.wakeford@newcastle.ac.uk

The Royal Society replies to this letter on page 27

The Prime Minister's speech

Ian Gibson writes the script



Speech writers went scurrying around taking soundings for the Prime Minister's Oxford speech on science.

At the time of writing, it is rumoured he will do others on the subject matter of British science. Here is a text for him. It follows several meetings I've had in Parliament, involving scientifically orientated MPs and members of the House of Lords.

'The Prime Minister' speaks

'Given the difficulties in the communication channels between advisers in government, backbenchers, the public and scientists on scientific issues, we need to set up a section, perhaps in the Cabinet Office, which tackles scientific problems. We need to put science much higher up the agenda in policy making – thus recognising the importance of its input into key policy areas, for example, climate change, TB and all health issues.

We must stimulate our young minds who now are learning how to do science, and facilitate school science teaching and research. They need to have a new career pathway very different from the classic undergraduate–postgraduate route, with various new skills being incorporated into the programme. There is no reason to assume everyone will end up doing science research and teaching. Some may use their scientific training to cast light on various other issues. Why not! Let's do it. Their understanding of how to accumulate and assess evidence will be invaluable.

Despite the uncertainties of scientific explanations and the problems of risk analysis, it is reasonable to anticipate that scientific endeavour will give us the knowledge and experience to progress our lives. We should have learned from the problems of BSE, GMOs and MMR jabs how the media tackles the issues, how the public feels on media stories and how scientists stay aloof.

Elected minister

'Since science is now so important in government policy determination, I intend to have an elected Minister of Science in the Commons and to centralise his or her team in the Cabinet Office. It will be on top, not on tap.

We will undertake a major review of all departments and how they utilise scientific knowledge. Regional Development Agencies will have a 10-year science policy to fund renewable energies, biofuels, sustainable homes and new industries and we will create more Science Cities.

We are prepared to talk to every company to see how they will play a part in these initiatives. Research and development will reach new heights in companies and they will get government support in ways to be negotiated, including tax incentives.

Policy priorities

'The difficulties with the National Institute for Clinical Excellence (NICE) decisions and their role following hostilities from the pharmaceutical companies and patient groups will be reviewed. We will encourage basic research leading to personalised medicine which, with proper public consultation, will accommodate decisions.

A review will be set up to look at how industry and universities can increase their co-operation to induce research pathways leading to business creation.

At the same time, we must not forget that research often turns up new phenomena, for example prions or mobile elements, following results which are difficult to interpret. This involves creating an atmosphere of scientific endeavour and sometimes reaching conclusions that may be unclear. Scientists must resist the urge to hype and be prepared to say 'I don't know' to aggressive political writers in the media who usurp science for its

political pay-offs. I intend to invite the media to a meeting with my Science Cabinet in order to prevent further biased reporting either way, for or against.

More innovations

'To progress our strong scientific base, I intend to fund a new computer set-up to allow microanalysis of the environment to investigate the potential of climate change in greater detail. I also intend to develop diagnostic assessment of disease and vaccine development against AIDS, TB and various cancers. Our understanding of energy creation and radioactive waste disposal requires a strong scientific input and these are now political priorities. This will involve major investment and support for younger scientists and technologists. Finally, we will adopt proton therapy for treatment of cancers.

Scientists and politicians fail to understand each other and so we require a major revamp of our science infrastructure. A strong central organisation shall replace the Chief Scientific Adviser and be involved in policy determination in every department of government. No more patronisation of science! A role up front in outlining problems and making policy decisions is now the order of the day.

We are aware that scientists have much to offer. It's time to invite them indoors to help create a successful economy, an informed health service and an international role in making poverty history.'

The Prime Minister delivered his speech on science too late to be included in this issue

Dr Ian Gibson
is MP for Norwich North
gibsoni@parliament.uk

Science in Society events

Working Lunches

The BA is running a series of Working Lunches throughout the UK in collaboration with the sciencehorizons project. sciencehorizons is a new programme of public dialogue about the implications of future science and technology. People will be asked to consider a series of questions which will help to discover people's aspirations, concerns and values about the science and technology of the future.

The Working Lunches will be for UK-based science centres, museums, learned societies, science festivals and community-based organisations interested in running events as part of sciencehorizons.

The Working Lunches will provide an opportunity for participants to hear about the sciencehorizons project, find out what they need to do to facilitate an event and provide practical guidance and support along with facilitators' packs. The lunches will enable discussions to be had around skills enhancement, marketing and fundraising for events where appropriate.

Cardiff	The Youth Eisteddfod Centre	12 December 2006
Manchester	The Manchester Museum	8 January 2007
Edinburgh	The National Museum of Scotland	12 January 2007
Oxford	Science Centre, The Oxford Trust	25 January 2007

Further information and details of how to book your place can be found at:

www.the-ba.net/workinglunches or email events@the-ba.net



sciencehorizons is funded by
the DTI's Sciencewise programme



For details about all BA's Science in Society programmes, visit:

www.the-ba.net/ScienceinSociety



Do you know a brilliant science communicator?

The BA Award Lectures are a rare opportunity to honour five professional scientists or engineers in the early stages of their career, who show outstanding skills in communicating to a non-specialist audience.

Winners will be invited to give a one hour presentation at the BA Festival of Science at the University of York between 10 and 14 September 2007; one of the most popular components of the Festival programme.



For more information about the Award Lecture scheme and how to nominate, go to www.the-ba.net/festivalofscience or email festival@the-ba.net

Nominations must be received by 24 February 2007

the **BA**  award lectures
british association for the advancement of science