

Science & Public Affairs

Science and
peace in
Antarctica



Searching for
immortality



The psychology
of terrorism



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Multi-reader subscriptions

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

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

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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.

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

Front cover picture: Field camp on Adelaide Island. *Pete Bucktrout, BAS*

Designed by Origin ID
www.originid.net

Printed by Holbrooks Printers Ltd,
Portsmouth, PO3 5HX

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Summer menu

This June - for the first time since 1977 - the UK Government is hosting the Antarctic Treaty Consultative Meeting. Delegates will meet in Edinburgh to discuss a wide range of scientific and environmental issues affecting Antarctica, as well as its heritage and governance. The Treaty, signed by 45 nations, has been in place for nearly 50 years to ensure Antarctica remains a continent devoted to peace and science. Becky Allen (p.6) gives a preview of the discussions and of the accompanying campaign to bring Antarctica to the public.

July sees the first anniversary of the London terrorist bombings. One year on, Andrew Silke (p.14) examines the government's response and asks whether it is sound, given what we know about the psychology of terrorism. He finds that some elements of new legislation are justifiable, but that it shows no understanding of the best way to change behaviour. While it is generally ineffective, he says, it does satisfy the public's demand for a tough stance.

As we make the most of long days, the SPATalk in this issue (p.4) invites us to think about prolonging the span of our

lives. Aubrey de Grey argues that we should be setting about curing ageing so that we can live indefinitely. Jon Turney, on the other hand, has reservations. He doesn't see the urgency, and he judges we're in denial if we think that science can postpone our decline or death.

The scientific community is no longer in denial about falling recruitment to physics and chemistry. Chemistry undergraduate Danielle Miles's saga (p.13) of teacher shortage, departmental closure and relocation, tells us all we need to know about the difficulties students can face in reading the subject. Andrew Ladds (p.12) sums up the dire consequences of the decline in chemistry, and describes some of the initiatives under way to reverse the trend. Meanwhile, physics graduate Paul Bostock (p.17) describes how his degree has fitted him for a career in the City.

The market for mobile phones has never been more buoyant: there are 5.5 million in the hands of young people in the UK alone. Mobiles increasingly have enhanced features such as colour screens, picture messaging, video cameras and internet browsers, and these have raised fears that children using them may be at risk from

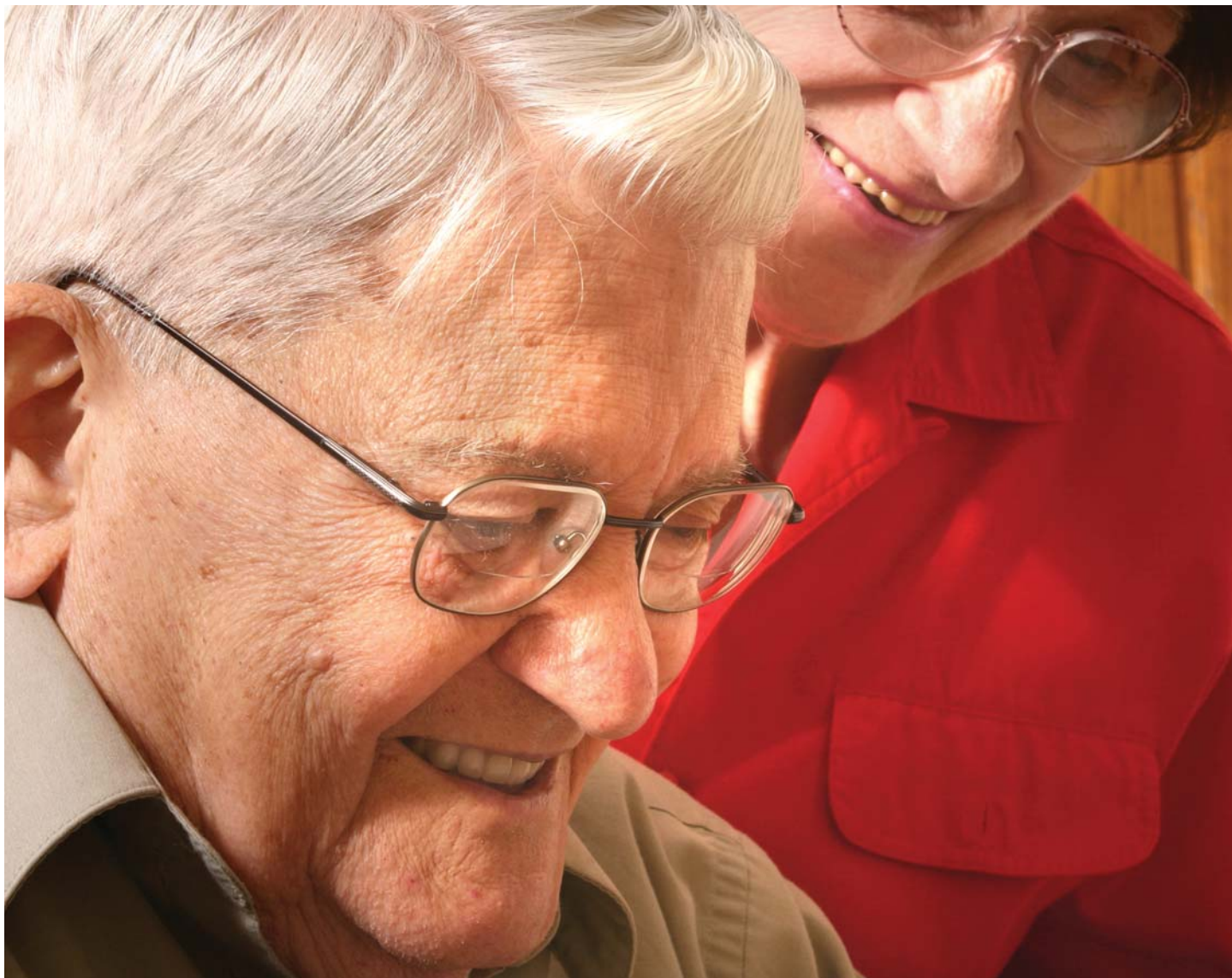
unsuitable material. The major mobile phone operators have developed and signed a voluntary Code governing new types of content, which aims to protect children. In an Exchange (p.22), Phil Willis MP sounds a warning about some mobile operators, while Will Gardner asserts that the Code is not empowering parents in the way it was meant to do.

All of us would find life impossible without texting. Over one trillion text messages were sent in 2005, of which over 12 billion were sent in China alone during the Lunar New Year holiday. Alan Cox, who helped develop the technology, recounts (p.16) how it came about - and reveals how hard it is to predict the killer app.

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Searching for immortality: a counsel of hope or despair?

Aubrey de Grey and Jon Turney differ



The last of life for which the first was made?

Dear **Jon**,

Ageing kills 100,000 people worldwide every single day. There is no difference between saving lives and extending lives - for what is saving a life if it is not giving someone the chance to live longer than they otherwise could? This is the first reason for curing ageing.

The second is choice: when these therapies are developed, individuals and societies will have the choice whether to use them. Some may reject them, just as the Amish reject much modern technology today; others may prefer to use them and cope with the

consequent changes in way of life (such as the need to have far fewer children in order to stop overpopulation).

We have a duty to provide that choice, rather than impose our values on a cohort of future humanity. Indefinite lifespan will be an option for them if we develop these therapies without delay, but not if we hesitate today.

Cheers, **Aubrey**

Dear **Aubrey**,

Extending lifespan through 'curing' ageing is an intriguing possibility. But I do not see a duty (a moral duty?) to do it right away.

Let's assume that there is virtue in maximizing a quantity – call it total current human life years – reckoned as the number of living humans multiplied by the time they have lived. If the planet's carrying capacity is finite, this is ultimately a zero sum game. We can have lots of people, or people who live indefinitely. But not both.

And as far as the planet goes, we have a few other things to sort out this century, as you'll have noticed. Pessimistically, we will be stretching our ingenuity coping with human induced environmental and climatic crises.

Optimistically, we will apply that ingenuity

to fashioning a world system in which a stable population of, say, 10-12 billion can lead humane lives.

There is no difference between saving lives and extending lives. This is the first reason for curing ageing

Sure, forging ahead with life extension would enhance choice for some. But the first beneficiaries would undoubtedly be the affluent city dwellers of the developed world who are already constraining the choices of billions who live elsewhere. A priority project? Not for me. Next century would be plenty soon enough.

Cheers, **Jon**

Dear **Jon**,

Your claim ('We can have lots of people, or people who live indefinitely, but not both') is true only if one counts all the people who are not yet born, as well as those currently alive. There's no problem with carrying capacity unless we also carry on having a lot of children. Thus, only if we say that hypothetical, yet-to-be-conceived people have the same right to life as currently living people is there any challenge to the moral imperative to cure ageing.

As to priorities, I ask: why are we currently doing so little to address these other problems? My answer is that ageing makes us fatalistic. It is a constant and horrible reminder of our failure to control nature, which limits our ambition to improve our world.

You're wrong about universal access, too. Three points: first, the first therapies will be experimental and risky. The masses will be grateful to the desperate rich for being the guinea pigs. Second, it'll be in the enlightened self-interest of the wealthy to make such profoundly life-changing therapies universally available, because the poor will get angry otherwise. We know the dangers of making lots of people really angry for a really long time. Third, the therapies will be repair technologies, not useful for the young. That means it'll cost less to provide these therapies to poorer parts of the world, where fewer people reach old age at present.

Cheers, **Aubrey**

Dear **Aubrey**,

I'm still curious about where your moral imperative is coming from. I note your last points, without actually agreeing. But I'm not going to respond to them directly, apart

from suggesting that the rich tend to find ways of testing 'experimental and risky therapies' on the poor.

In the end, though, I think this a question where arguments matter less than wishes. What I mean is that we all tend to take death personally. So when you advocate that radical life extension should be a choice for everyone, I assume you mean for you.

I am not so sure. I accept an authentic answer to whether I want to live to, say, 200, would come on my 199th birthday. But as far as I can tell, the prospect does not appeal enough to take on the urgency it clearly has for you.

This is a large difference in temperament, so it is interesting to ask where it might come from. I am a comfortable, educated, secular Westerner, in good health. You too, I fancy. I enjoy life, on the whole. Yet at 50, my existing life expectancy feels pretty OK to me. Am I in denial, do you think, or a hapless fatalist?

Cheers, **Jon**

Dear **Jon**,

Absolutely, you are a hapless fatalist in denial.

As things stand, you have a remaining life expectancy of a little over 30 years, which indeed sounds like all the time in the world. But consider your likely condition after, say, 20 of those years. You'll be ever more aware that you're becoming more debilitated, decrepit, dependent on others for basics of daily life. You'll make the best of it, but is it an attractive prospect? Hardly.

When you advocate that radical life extension should be a choice for everyone, I assume you mean for you

You might avoid it by hastening your death before that decline proceeds too far - but that seems unpopular too. The only other option is to develop therapies that permanently prevent the decline. And unfortunately for those who think they don't want to live a long time, the decline is what kills old people. There is no magic time bomb that will see us off at some appointed hour, irrespective of our vitality.

If it's easier for you to consider life extension as an acceptable side-effect of curing the disabilities and diseases of ageing, that's fine, and I won't even say 'I told you so' when your 199th birthday comes around and you seem keener on benefiting from my forward planning than you are today.

Cheers, **Aubrey**

Dear **Aubrey**,

Thanks for confirming that this discussion is really about attitudes, not arguments. Actually, I don't think 30 years, or even 50, is all that long. But then you are the one who seems to want all the time in the world. I can think of plenty of things I'm never going to get round to doing, but I am continually amazed our culture offers so many things to choose from. One can make choices without regret.

You are right, of course, that no-one relishes becoming decrepit. The process of dying is surely more frightening than the result. There are many things we might do, medical and social, to achieve a more graceful ending. But denial lies in believing that the end, or even the decline, can now be avoided by the appliance of science. We are all going to end up the same way, sooner or later. You are just going to be more disappointed about it than I am.

Perhaps one of the choices we can make is to recognise that death is no big deal. It is astonishing that any of us is here in the first place. But however wonderful our brief interval between bouts of oblivion, I take comfort in finitude.

Unambitiously, **Jon**

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Science and peace in Antarctica

Becky Allen previews this summer's Antarctic Treaty Consultative Meeting



Research in Antarctica: promoted under the Antarctic Treaty. *Pete Bucktrout, BAS*

Thousands of tourists visit the Antarctic each Austral summer, yet few will be aware that for nearly 50 years a unique international treaty has been in place to ensure Antarctica remains a continent devoted to peace and science.

The Antarctic Treaty

The Treaty itself was born out of post-war international scientific cooperation. The UK has been involved in Antarctic research for more than 200 years, but it was the International Geophysical Year (IGY) of 1957-58 – a multinational research programme of coordinated geophysical observations by 67 nations – which showed that it was possible to establish bases on Antarctica and engage in scientific cooperation without getting into conflict about the different, sometimes overlapping, claims of sovereignty over the continent.

The Antarctic Treaty was signed in 1959 by the 12 countries whose scientists had been active in Antarctica during IGY, seven of which – Argentina, Australia, Chile, France, New Zealand, Norway and the United Kingdom –

had territorial claims over parts of the continent. The Treaty came into effect in June 1961, and the 45 nations who are now signatories gather annually at the Antarctic Treaty Consultative Meeting (ATCM).

Edinburgh 2006

Although the precise content of the ATCM is formed by working papers submitted by the countries present at the meeting, delegates are likely to be discussing and agreeing priorities for future work on environmental management, particularly in the context of climate change. Other issues will include the sustainable management of tourism, the International Polar Year¹ and the underpinning legal framework of Antarctic governance.

The Foreign & Commonwealth Office (FCO) told *S&PA*: 'Although it is many thousands of miles from the UK, Antarctica matters. Science in Antarctica can answer global questions – for example, ice cores in Antarctica can tell us about the history of the Earth's climate over the past 800,000 years, which is vital for our present climate change

modelling. The ATCM offers an opportunity for experts to discuss those global questions and ensure that Antarctica is managed in a way that enables its resources to be used most effectively in helping to answer them.'

Science in Antarctica can answer global questions – ice cores can tell us about the history of the Earth's climate

For those interested in science and policy, the Antarctic is a fascinating example of what can be achieved by consensus, despite widely differing national agendas. According to Professor David Walton of British Antarctic Survey (BAS): 'Over the past 40 years the Treaty Parties have grappled with resource management (both biological and geological), pollution, habitat and species damage, the value of historical heritage, the management of and access to scientific data, the development and control of tourism, conservation at the habitat and species levels

and the contribution of Antarctic science to our global understanding, amongst many other topics.'

Antarctic science

The discovery by scientists from BAS of the hole in the ozone layer in 1985 – which led to a worldwide ban in the use of CFCs – is just one of many examples of the global importance of Antarctic science.

The continent also has a crucial role to play in understanding global climate change.

Locked in its ice sheet is a record of past climate change extending back almost one million years. Bubbles trapped in the ice act as time capsules containing atmospheric gases from previous centuries, providing evidence of the earth's natural rhythms, as well as past levels of pollution by industry, agriculture and even atom bombs.

The frozen wastes of Antarctica have always fired the public imagination. It is not only the coldest, windiest and most remote continent on earth, but also the highest and driest. Scott and Shackleton, *Endurance* and *Discovery* are names that occupy a special place in the British psyche. This year's ATCM is – for the first time – being used as an opportunity to bring the Antarctic to the public. *Discover*



Weather balloon release at Halley Research Station.
Chris Gilbert, BAS

@ a glance...

The Antarctic Treaty was signed in 1959 to promote peaceful scientific cooperation in the Antarctic

The UK Government is hosting the Antarctic Treaty Consultative Meeting in Edinburgh from 12-23 June

Delegates will probably agree priorities for future work on environmental management, particularly in the context of climate change, and the International Polar Year¹

Alongside the meeting, Edinburgh will be treated to *Discover Antarctica!*: an extensive programme of events, exhibitions and performances to engage people in research into big global issues like climate change, and bring Antarctica to the public

Antarctica! – as the public programme is branded – will deliver a rich and varied series of events to the public of Edinburgh.

Discover Antarctica!

Organised by the FCO and BAS, *Discover Antarctica!* includes a series of three interlinked exhibitions showcasing Antarctic science, art and heritage plus four evening performances at the Edinburgh International Conference Centre, the ATCM venue.

One exhibition, *White Horizons – British art from Antarctica from 1775-2006*, brings together 50 paintings in the first show of its kind to be held in the UK. The exhibition includes work by artists who accompanied the early Antarctic explorers, as well as those who go south today as part of the BAS artists' and writers' programme. Also on show will be *The Antarctic photographs of Herbert Ponting* – iconic images of Scott's British Antarctic Expedition of 1910-1913.

Edinburgh International Conference Centre will also be the venue for four evening performances by scientists and film-makers, including Professor Lloyd Peck of BAS, who presented the 2004 Royal Institution Christmas lectures, Alastair Fothergill and Vanessa Berlowitz from the BBC Natural History Unit, who will take the audience behind the scenes of BBC wildlife filming in Antarctica, and Dr David Munro of the Royal Scottish Geographical Society, who will be celebrating Scotland's forgotten polar heroes.

BAS will be bringing its Royal Research Ship *James Clark Ross* to the waterfront at Ocean Terminal in Leith where it, and the Royal Navy's ice patrol vessel *HMS Endurance*, will be open to the public during the weekend of 17-18 June, giving families a rare glimpse of the science that goes on in the Southern Ocean.

Many Edinburgh science and visitor attractions are taking part in *Discover Antarctica!*: the BA, Edinburgh Zoo, Our

Dynamic Earth, the Royal Observatory, Deep Sea World, the National Museums of Scotland and the Royal Society of Edinburgh have all collaborated to produce an amazing programme of films, talks, and hands-on activities.

According to Linda Capper, head of press, PR and education at BAS: 'As a government-funded research organisation, BAS has a commitment to engaging people in its research into big global issues like climate change. The ATCM provides us with the perfect focal point for a whole range of public events to attract everyone from small children to university professors. Working with the Edinburgh branch of the BA and local visitor attractions enables the FCO and BAS to enhance ATCM events and provide a fantastic Antarctic experience for the people of Edinburgh, Leith and Central Scotland.'

'The enthusiasm for the ATCM and *Discover Antarctica!* among Edinburgh's visitor, science and business communities is proof that Antarctica, as a continent for peace and science, nurtures a true spirit of cooperation – whether within science, governments or science communicators.'

For further details about the Antarctic Treaty Consultative Meeting XXIX, and *Discover Antarctica!* visit www.atcm2006.gov.uk

Reference

1. 2007-2008: an international initiative in which thousands of scientists will further our understanding of polar systems. See www.ipyr.org

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Shorts

In brief

Strategy for science in society

The eight UK Research Councils have published their joint Science in Society strategy, providing for the first time a framework for the Councils to cooperate on communicating with the public. The strategy document, available at www.rcuk.ac.uk/sis/strategy.htm, outlines four main strands: finding out what people think; reaching young people and teachers; encouraging researchers to engage with the public and keeping people informed.

EU funding has hidden costs

A report released by Universities UK and the Higher Education Funding Council for England (HEFCE) highlights the relatively low cost recovery and high levels of bureaucracy associated with EU projects compared with UK Research Council projects. Although there are benefits of European research funding, higher education institutions must look carefully at the costing and future sustainability of EU-funded work, says the report. See: www.universitiesuk.ac.uk/research

Better humans?

Demos and the Wellcome Trust have called for a public debate about the implications of new technologies such as memory-enhancing drugs, genetic selection of children, and dramatic increases in life expectancy. Their report, 'Better Humans?' makes a number of policy proposals including the establishment of a Schools and Universities Anti-Doping Agency and a Commission on Emerging Technologies and Society. See www.demos.co.uk/catalogue/betterhumanscollection

Technical centre to fight terrorism

The Ministry of Defence (MOD) is to create a new 'Science and Technology Counter-Terrorism Centre' to inform and coordinate its technical response to terrorist threats. It will be 'a world class hub' drawing on the chemical, biological, radiological, nuclear and explosive threats expertise of scientists from across the MOD, and the academic and industrial communities, according to Defence Secretary John Reid.

Twin tracks to tackle climate challenge

Energy and the climate dominated the political agenda this spring, as the government published a review of its Climate Change Programme and moved its Energy Review on to the next phase of consultation.

The Climate Change Programme Review met widespread derision as a result of its disclosure that the UK would miss its target of a 20 per cent reduction in CO₂ emissions by 2010, instead looking likely to achieve a reduction of between 15 per cent and 18 per cent. Lord Martin Rees, President of the Royal Society, said: '... the Government appears to be pinning its hopes on measures that haven't delivered in the past, such as its policies on energy efficiency, which makes it difficult to have confidence that the projected emissions reductions will be delivered.'

The Green Alliance – a group of 35 organisations including renewable energy associations, green campaign groups and the Institution of Mechanical Engineers – pointed to the government's failure to reach its target but welcomed measures to encourage household energy efficiency and the strategy for microgeneration.

'Fifteen per cent by 2010 would be disappointing,' Guy Thompson, director of the Green Alliance, told *S&PA*. 'The ETS (EU emissions trading scheme) decision [faced by the government later in the year] will be crucial. A tight cap will be needed for phase two if it's to bring UK emissions down. We would also like to see the introduction of a traded emissions scheme within the UK to encourage initiatives by the retail and transport sectors, for example.'

Socio-political problems

The response from Professor Mike Hulme of the Tyndall Centre for Climate Change Research was more encouraging: 'The government should be commended on laying out the most comprehensive policy programme on climate change of any nation state... remember, this is a serious policy programme being undertaken in an open democracy.'

These comments, he explained, were intended to point out that the UK still has leadership and credibility in this area. 'These are deep, intractable, socio-political problems,' he said. 'No government can guarantee by dictat any particular reduction in emissions by any particular date.'

'The challenges are threefold: to finesse the party political system; to confront the international context; and to overcome the problem that in an open democracy, there are limits to what any government can do by way of radical leadership if they think there is a risk of rebellion,' he said.

Energy Review

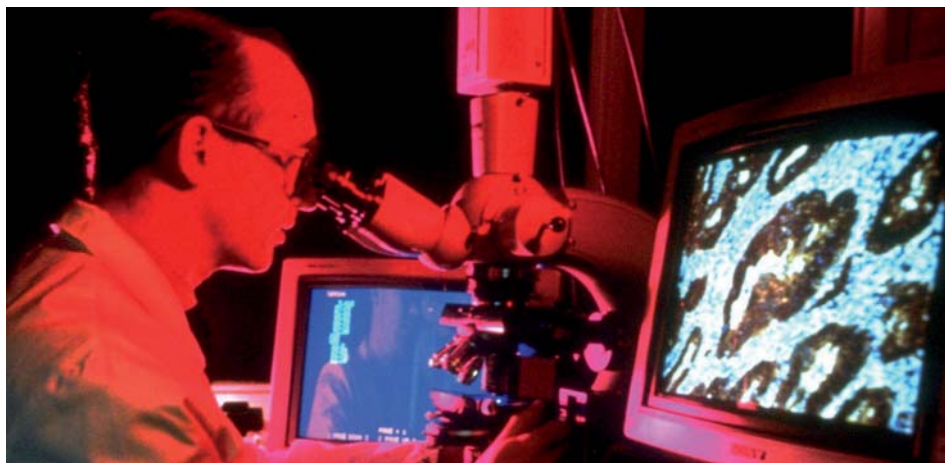
Meanwhile the government is analysing contributions from more than 500 energy and environment experts and more than 2,000 written submissions to its Energy Review consultation, on which it will report by the summer. The decisions that will ensue will 'determine energy strategy up to the middle of the 21st century,' and will 'underpin policy goals,' including to cut CO₂ emissions, said energy minister Malcolm Wicks.

The Climate Change Programme Review is at <http://tinyurl.com/q6fy4>



All aboard the energy review: Energy Minister Malcolm Wicks proselytizes passengers on a low-emission hybrid bus

Budget throws sensitivities into relief



Pre-clinical cancer research: pharma budget nerves. *NewsCast*

The 2006 budget stimulated important debates on issues where its implications intersect with science and research policy.

The most prominent reactions came from three areas. The first, a boost to science teaching to the tune of £30.5m over the next two years, aimed at recruiting 3,000 extra science teachers, met with almost unanimous approval.

However, the Campaign for Science and Engineering in the UK (CASE) said that still more is needed – especially since, without a policy to reverse the trend of university science department closures, they could not foresee where the science teachers will come from.

Fate of the RAE

The second, a call for the abolition of the Research Assessment Exercise (RAE), made plain the divisions within the academic community on the proposal.

While CASE said it couldn't happen soon enough, as did many newer universities, Universities UK (UUK) took a more cautious line. 'UUK has an open mind as to what should happen post RAE 2008, but we would not want to see the abolition of the RAE without a viable alternative, which has the full confidence of the academic community, to replace it,' the organisation said, adding that it looked forward to taking part in a full debate on the alternatives.

The alternatives in question revolve around the use of 'metrics' to establish the research merits of a department, such as grant income from external funding sources and citation counts.

The Royal Society appears to take an even

more guarded line. Although it welcomed the government's intention to move towards 'a simpler and less burdensome system', Lord Martin Rees later defended the RAE in a House of Lords debate, in which he said that it offered a refined method of discrimination, and that using metrics alone could risk discriminating against researchers who produce 'brilliant work on minimal resources'.

The Russell Group, an association of 19 major research-intensive universities, had not at the time of writing formed a consensus opinion.

Medical research

The third announcement of interest to the research community was that the government-allocated research funds of the Medical Research Council (MRC) and the National Health Service (NHS) would be merged to create a single fund of 'at least £1 billion.' This was warmly welcomed by the MRC, and also by CASE, who saw potential for the NHS research budget to be used more effectively.

But the Association for the British Pharmaceutical Industry (ABPI) saw potential pitfalls, warning: 'It is essential that this amalgamation does not put at risk the pre-clinical research base – a vital part of the MRC's remit – that has been the foundation of pharmaceutical industry R&D investment.'

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In brief

Classifying illegal drugs

The Commons Science & Technology Committee has published a report on the way the government classifies illegal drugs. It concludes that drugs are not being classified according to the harm they cause. The report also says that the gateway theory, that the use of drugs like cannabis leads on to the use of harder drugs, has little evidence to support it.

Creationism spat continues

The Royal Society has issued a statement opposing the misrepresentation of evolution in schools to promote particular religious beliefs. The statement says that while 'many people both believe in a creator and accept the scientific evidence for how the universe and life on Earth developed ... some versions of creationism are incompatible with the scientific evidence.'

Drug testing faces test

Research reported in *Nature*, as well as an alliance of seven organisations, has suggested that the terrible outcomes of the TGN 1412 drug trials, in which six people suffered severe allergic reactions despite no forewarnings from tests on monkeys, highlight the inadequacies of animal tests. 'Antibody-based medicines such as TGN 1412,' said Focus on Alternatives, 'are particularly likely to cause side effects that cannot be safely predicted from one species to another.' See <http://www.focusonalternatives.org.uk>; www.nature.com/news

Countering research fraud

A panel has been set up to tackle research fraud in the UK. Announced by Universities UK, the UK Panel for Research Integrity in Health and Biomedical Sciences has been welcomed by the British Medical Association and the Committee on Publication Ethics. It will be supported by the funding and Research Councils and the Department of Health.

Morality, theology and action on climate change

Tim Flannery on the moral dimension

Climate change is a moral issue because each and every one of us is responsible for the greenhouse gases that are warming our planet.

Climate change is a real, unfolding threat to everything we hold dear – from our children to our cities, our biodiversity and our wealth. No rational person would endanger all of that just so they could continue driving large cars and not thinking about where their electricity comes from.

Society needs community leadership on this issue. Our institutions and churches should be leading the way by taking visible stands on reducing their emissions. Sadly I don't see a lot of solar panels on churches or public institutions anywhere. And business can be a powerful tool for change. Has your business had an energy audit done?

We also need political action. Britain has a proud history of leading the global community in the fight to stabilise our climate, and that commitment should not be allowed to flag. Indeed it needs to strengthen.

Warming up

A climatologist will tell you that climate is the sum of all weathers for a given time and place. But to an evolutionary biologist like myself, climate is the grand driver of evolution.

Changes in climate have often caused the extinctions that geologists use to divide up the geological time scale, so we know that climate change can be dangerous to life. Climate is always changing, but it's the big, swift changes that are the most dangerous.

Modern climate change is an air pollution problem caused by the release of greenhouse gases, especially CO₂, into the atmosphere. These gases trap heat near the Earth's surface – the source of global warming. And global warming can lead to climate change. Our atmosphere is a finite pollution dump: compress its gas into a liquid and you'd discover that it is only one 500th the mass of the oceans.

If we continue burning fossil fuels without restraint, by the end of the twenty-first century CO₂ levels could double and Earth's temperature increase by 3.5 degrees Celsius. There is of course uncertainty in these projections, but this is the average estimated



Global warming: we need a change of attitude to avoid a bumpy landing. ©Achim Holzem

temperature increase.

Earth's climate system responds to warming in jerks, and the timing and scale of these rapid shifts are not predictable. Climatologists have identified two such shifts, in 1976 and 1998. Both brought changed weather patterns and rainfall.

How Earth might change

To predict how our world might change as a result of all of this, we can use three yardsticks: the geological record, the changes already occurring as a result of present warming, and computer models.

By the yardstick of the geological record, 3.5 degrees of warming in a century is a large scale and exceedingly swift change. By comparison, at the end of the last ice age Earth warmed five degrees in 7,000 years. In response, the seas rose over 100 metres and species migrated the length of continents to find suitable climates.

Scientists have already documented changed weather patterns, species extinctions and modest rises in sea level as a result of the 0.63 degree of warming that occurred last century, and computer models indicate that these changes are likely to amplify as the warming continues. Some projections of extinction rates suggest that between one fifth and one third of all species

may become extinct as a result of 3.5 degrees of warming.

There is still uncertainty about how much sea levels will rise, but 115,000 years ago, when the Earth was just one degree warmer than today, the seas stood four metres higher than at present. Many scientists are concerned that the overall changes brought about by the projected warming will be sufficient to destabilize Earth's ecosystem and our civilization.

Individual action

As stronger community leadership would show, there is a lot individuals can do. Energy efficiency can lead to large emissions reductions. Trading your large car for a smaller vehicle, or even a hybrid, can lead to reductions from personal transport of 70 per cent, which is the amount we need to reduce our emissions overall by 2050 if we hope to stabilize climate.

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Theology can point the way, says Claire Foster

‘Smoke is the incense burning on the altars of industry. It is beautiful to me. It shows that men are changing the merely potential forces of nature into articles of comfort for humanity.’

So said Chicago businessman WP Rind in 1892. Descartes had given the confident men of the Industrial Revolution to believe that they were masters and possessors of the universe – and Christian theology supported him. As Genesis had been read, human beings were placed on the Earth to dominate nature. It was God’s will, and therefore our duty, that we should bring nature under control and make it serve our purposes.

Bad theology

While there were not too many humans and the scope of our technology was relatively narrow and local, this did not matter too much. But as human inventiveness, productivity and the reach of industrialisation increased, so did their effects, till the twentieth century saw an unprecedented invasion by human activity in all the spheres of the Earth.

We heated up the atmosphere; we polluted the rivers and seas of the hydrosphere, and dammed them indiscriminately; we mined the lithosphere; we farmed the soils; and we emptied the biosphere. We became a rogue species, dominating all other species, who had to find a way of adapting to life with us or die out. Because we lived within a worldview that assured us we were special, we thought that didn’t matter.

It is the way we perceive the world and ourselves that determines how we behave. It will become obvious that treading lightly on the Earth is the way to live

Now the Earth is asserting itself against us and we are bound to take notice. Some prophets think we are heading for a new era of loneliness – the eremozoic era – in which humankind has to create artificial

environments in which to survive because the environment of the natural world has become so toxic to us. Like a body’s immune system rejecting alien organisms, the Earth will reject us – because we have become so toxic to it.

A paradigm shift is needed. There are insights within the Christian tradition to live rightly with the Earth. The understanding of Genesis that led to human domination was simply bad theology.

Wise interdependence

The Hebrew word for divine creativity used in the Genesis story is *bara* and it shares a root with the word used for covenant: *berith*. The root conveys the sense of a binding web of relationship. Think of everything in the whole universe connected to everything else in a kind of spider’s web. The web is invisible; all we can see are the parts. If everything in the whole creation is joined in this way, and some cuts are made, everything is affected. If only a few cuts are made, the web can recover and the interrelationships can continue. If enough cuts are made, the whole thing can fall apart.

A paradigm shift is needed. The understanding of Genesis that led to human domination was simply bad theology

The word for that which joins everything together in this way is Wisdom – she who was with God at the beginning as the masterworker. For me, it provides a world view within which I can understand how it is that there is so much diversity and yet the world somehow holds together. When I read EO Wilson’s exquisite account of evolution, or James Lovelock’s tender account of Gaia, I think of Wisdom. When I read Tim Flannery’s graphic account of the ways in which the systems that hold our planet together are falling apart, I think of the abuse of Wisdom.

Now that we know we evolved along with all other creatures and things that make up this beautiful planet of ours, now that we know how profoundly interdependent everything is, that the very diversity of things

is what sustains life, we have to shed our assumption of human dominance and specialness. Today’s worldview should be of wise interdependence.

It is the way we perceive the world and ourselves that determines how we behave. Change the perception, and everything follows. That is the meaning of the Greek word for repentance – *metanoia* – which means to change one’s mind. It will become obvious that treading lightly on the Earth is the way to live. Indiscriminate use of the Earth’s resources will be seen as profoundly wrong, just as we now see slavery as wrong. This change of perception is something for each and every one of us, right now, to address.



The Christian tradition gives insights into living rightly with the Earth

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What are we going to do about the decline in chemistry students?

Andrew Ladds surveys the scene from the top

Between 1997 and 2003, the numbers of UK university chemistry students declined by 15 per cent, while the popularity of less traditional subjects rose (psychology, for example, by 73 per cent).

The Society of Chemical Industry (SCI) has found that a coordinated approach from UK government, industry and academia is required to ensure that enough able and qualified scientists are educated in the UK to meet industry's current and future requirements. Accordingly, SCI has urged further action on science education to protect not only our industry but the UK's economic health.

Current problems

The Society of Chemical Industry (SCI) surveyed its 3,000+ UK members for its recent Insight situation paper, *Strategic chemistry-based science education into the 21st century*.¹ The paper confirms that the shortage is not confined to chemistry students, but spans all science, technology, engineering and mathematics disciplines.

The day before the paper's publication, Sussex University announced that it was to stop teaching its chemistry degree. The department which had educated two Nobel Prize winners – Sir Harry Kroto and Sir John

Cornforth – will in future provide only 'chemistry with...' courses. The growth in numbers of these 'hybrid' subjects at the expense of pure chemistry is another concern of the Insight paper.

Local industry tends to use local university chemistry departments for research and development. The UK cannot afford to lose any further science education facilities such as these. The Sussex closure is the most recent of a number of high profile closures of science/chemistry departments.

Looking to students post-qualification, the survey also strongly underlines that students are not informed of the careers opportunities available with a science degree. This, the paper suggests, could be remedied in part by increased exposure to contemporary industrial science and technology, and significantly improved careers advice.

Dire consequences

The threats posed by inaction on these warnings will not be confined simply to chemistry but will touch almost all parts of our everyday life: food, healthcare, electronics, energy, transport and construction to name but a few. All of these sectors have growing requirements for increasingly sophisticated application of scientific and technological skills.

The Insight paper also highlights the potential erosion of the UK's national competitiveness on the world stage if it does not produce more of the right quality science graduates. Developed economies such as the UK's, with high labour costs, must focus on the development of high value added industries and services and the skills required to deliver them.

Current initiatives

The Department of Trade and Industry (DTI) has recognised the need to continue the move towards these wealth generators and to focus on the development of technology for them.

Last year, the UK's Chemistry Leadership Council (CLC) Innovation Task Force identified and proposed chemistry-based technology development priorities for the next two decades. As part of this, a Chemistry

Innovation Knowledge Transfer Network (CIKTN) is being established with DTI assistance to foster the linkage between academic research and the needs of industry.

The CLC's paper, *Vision for the sustainable production and use of chemicals*,² has also spawned a powerful alliance of industry, professional and academic associations, in the form of Sustainable Chemistry UK, to address the challenges the publication highlights.

The Insight paper is concerned about what happens when school children decide whether to take the three sciences as individual GCSE subjects. It suggests that some schools encourage pupils to take GCSE only as a double subject, motivated by curriculum simplification and, perhaps, potentially better overall school results statistics.

This was addressed by Chancellor of the Exchequer Gordon Brown in his March budget when he announced a new entitlement to study the full range of science subjects at GCSE level. He also committed to a programme for the 'recruitment, retraining, retention and reward' of 3,000 science teachers. While SCI welcomes these commitments, it is concerned about where the additional teachers will be sourced. At the moment, only 40 per cent of sixth-form students are taught chemistry by teachers with a chemistry degree.

Only about seven per cent of those taking chemistry at A-level go on to study it at university. There remains much to be done in both schools and academia to revitalise interest among pupils and students at all levels in the study of science in general and chemistry in particular.

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Endangered species? © Andrei Tchernov

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Danielle Miles peers up through the chaos

I am a second year Chemistry Masters undergraduate at Leeds University. I have often wondered if I should be taking chemistry at all.

As a very young child I was always interested in jobs that ended in *ist*; geologist, zoologist, and so on. I chose chemistry because it is often seen as the middle science, touching maths, physics, biology, pharmacology and much more. It would let me keep most of my options open. All I had to do was get through my A-levels and into a university.

A-level trouble

This should have been simple enough, but my chemistry teacher left part way through my A2-level and I was left to teach myself with guidance from a biology teacher. This put a huge strain on my other A-levels, as I was putting most of my time into chemistry.

Luckily, Exeter Chemistry department saw past the grades and saw the head girl who had managed to complete her chemistry A-level even though most of her classmates had dropped out. I was so happy to be accepted and determined to make the most of the opportunity.

Exeter closure

I started at Exeter in September 2004. I was getting a first for all my coursework and having the best year of my life. It was fantastic to be taught by someone with a love of the subject.

Then in November 2004 we were told that Exeter University was in financial trouble and was intending to shut down the expensive Chemistry department. I was incredulous: how could a 'good' university not have a core department? I was sure this would not be allowed to happen, but neither HEFCE nor the government stepped in to help us!

I helped to organise a 2,000-strong protest against the closures, and gave evidence to the Commons Science and Technology Committee's inquiry, 'Strategic Science Provision in English Universities'.¹ We were told that practically all the staff were being made redundant on 1 July 2005, but that we would be able to stay at Exeter to finish our degrees.

I couldn't see how this would be possible and decided to transfer to Leeds. Had I gone to Bath or Bristol, Exeter would have helped with the transfer; but as it was, I had to go through UCAS again.

On to Leeds

Leeds chemistry department has been very helpful and I cannot fault it, but the uprooting has been difficult.

I have gone into halls again and, with the demanding second year workload, I have found it hard to make new friends. I've missed out on the little things you learn in first year: knowing who to go to for help, and the way the exam and coursework system works.

The latest obstacle is the AUT and Natfhe strike, which has meant that my work from March 2006 has not been marked and there is a chance that my summer exams will not be marked either. Nevertheless I am still on target for a first class degree, and am currently set for a year at AstraZeneca, which I'm really looking forward to.

Remedies

I don't think there is any quick fix for the state of chemistry in this country. Fewer qualified secondary school teachers pass on their enthusiasm for the subject, attracting fewer students and setting up a vicious cycle. Also the paranoid health and safety regulations at school have curtailed the practicals permitted, and even non-chemists can tell you that they are the best part. Even so, maybe more money could be given to schools for trips to universities where they can watch demonstrations and see the exciting things that you can do with chemistry.

Another problem is the 'geek' image if you take chemistry, although I certainly don't class myself as a geek. I think this problem is due to the media. We should be as proud of scientists as we are of pop stars and sports stars, if not more so!

Maybe we need a campaign such as the current army one, with adverts on all the possibilities a chemistry degree could provide.

I still love chemistry and feel that I have been through too much to quit. However, I feel that I have been let down every step of



'I've been through too much to quit' - Danielle Miles

the way, by many different people and for many different reasons, but mainly the government for not supporting chemistry. I feel as though it doesn't realise the importance of what is going on in front of its eyes.

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The psychology of terrorism

Andrew Silke asks whether government policy will win hearts and minds

The UK has the most extensive anti-terrorism laws of any European country. In the light of psychological research, do they make sense?

UK law

In the past six years alone, the UK has had no fewer than four major pieces of anti-terrorist legislation. The most recent, the Terrorism Act 2006, incorporates measures to stop the encouragement of terrorism, preparation of terrorist acts and terrorist training. In particular, it criminalises the 'glorification' of terrorism.

This controversial measure is intended to allow the police to act against people who 'praise or celebrate' terrorism in a way that makes people think they should emulate such attacks. It also greatly increases the time suspects can be held without charge, from the previous maximum limit of 14 days to 28 days.

A major stated aim of the Terrorism Act 2006 is to disrupt the recruitment of potential terrorists. Much of the act is not aimed at terrorists themselves, but instead at people who previously have existed on the fringes of extremist movements. The Terrorism Act 2006 implicitly recognizes that social context plays a vital role in terrorism.

Recruitment and radicalisation

Psychological research suggests that becoming a terrorist is best seen as a gradual process. Research by Marc Sageman, for example, has highlighted that a very large proportion of Al-Qaeda recruits became radicalised as a group of friends, and not as isolated individuals.¹ Over time – in most cases at least a few years – the group gradually became increasingly extreme in their political views and more isolated from the mainstream society around them. Terrorism was not seen as acceptable at the beginning but slowly became a justifiable option as time passed. As these groups gradually radicalised, they often sought out the sermons of radical preachers and were exposed to extreme propaganda videos.

The Terrorism Act 2006 targets those who provide such sermons or material and in that sense the legislation can appear to have some justification. However, there are problems.

One, there is a risk of overestimating the importance of UK-based preachers like Abu



Terrorism in London: the authorities react

Hamza. Marc Sageman's research has highlighted that jihadis generally become radicalised relatively independently of known extremists.

Research on Chechnyan suicide bombers has found that almost all have had one close relative killed by the Russian security forces

Second, 'glorification' is not the only – or indeed even the most important – element in radicalisation. There are several other factors that play vital roles. One driving issue is that radicals believe that their identity is under threat. Any given society will possess some minorities and other disaffected groups who

rightly or wrongly perceive that the world is treating them harshly. It is from such pools that individual terrorists emerge.

Radicals who join movements such as Al-Qaeda believe that Muslims are under threat in a variety of regions. Events in Kashmir, Chechnya, Bosnia, Israel/Palestine, Afghanistan, Iraq, all provide evidence to support such a view.

Within the UK, Muslim populations experience higher levels of unemployment, lower average incomes, lower educational achievement, and less political representation than any other major religious grouping. The disadvantages faced by British Muslims in this regard are considerably worse than those experienced by Catholics in Northern Ireland in the 1960s (discrimination which eventually helped fuel the terrorism of the Troubles).

@ a glance...

The Terrorism Act 2006 criminalises the 'glorification' of terrorism

Its targeting of people who provide extreme propaganda seems justified given the way terrorists are recruited

Radicals believe that their identity is under threat, and prohibiting the glorification of terrorism will not affect this

Much of the recent legislation introduced in the UK may be ineffective in general, but it does meet a powerful public demand for a tough stance

It is much easier to change behaviour with rewards than with punishment, but current legislation introduces no carrots to accompany its many sticks

From disaffection to violence

Psychological research also highlights that the move from the disaffected to violent extremist is usually facilitated by exposure to a catalyst event (or series of such events). Normally, this is an act of extreme physical violence committed by the police or security forces or other rival group against the individual, family, friends, or simply anyone they identify strongly with.

We know for example, that most Palestinian suicide bombers have had at least one relative or close friend who has been killed, maimed or abused at the hands of enemies. Similarly, research on Chechnyan suicide bombers has found that almost all have had one close relative killed by the Russian security forces.

Research highlights that direct personal experience of violence is not necessary to facilitate joining. Vicarious exposure through television can be enough, if the images are dramatic and persistent enough. For some Muslims, scenes of violence in Iraq, Israel and elsewhere can provide a catalyst motive.

Ultimately, the combination of a sense of belonging to a beleaguered group combined with the experience of an act (or acts) of extreme violence against either oneself or significant others, is the impetus for some to engage in terrorism.

Legislation ineffective

The Terrorism Act 2006 does nothing to tackle any of these issues, and in the end we should have very modest expectations from any piece of anti-terrorism legislation. Clive Walker, the UK's leading expert on anti-terror law, has concluded that anti-terrorism legislation has rarely proved decisive in fighting terrorism.

For the most part, existing legislation already criminalises terrorism-related

activities. This was clearly illustrated in the case against radical cleric Abu Hamza who was found guilty on 11 separate offences brought under existing criminal legislation. The successful prosecution of Hamza on so many charges of course raises questions as to the need for much of the Terrorism Act 2006.

Public opinion

However, it is misleading to judge counter-terrorism legislation and policy purely in terms of the effects on the terrorist groups and their supporters. Public opinion has always been a major factor.

In polls and surveys carried out in the aftermath of terrorist attacks, a clear majority consistently approve the introduction of hard-line measures to tackle the terrorists.

Everything is focused on terrorists' capture and punishment. In contrast, several countries have used legislation to facilitate pathways out of terrorism

In the United States, the few occasions where the US has responded aggressively to terrorism have all been met with warm and overwhelming domestic approval. Though condemned internationally, the American bombing of Libya in 1986 was approved by 77 per cent of US citizens polled. The two strikes authorised by the Clinton administration, first against Iraq in 1993 and then against alleged Al-Qaeda in 1998, had approval ratings of 66 and 77 per cent respectively.

Ultimately, for any government which wishes to make a widely popular response to terrorist violence (at least among its own domestic population), introducing tough,

harsh measures and policies are by far the most obvious choice. Much of the recent legislation introduced in the UK may be ineffective in general, but it does succeed in meeting a powerful public demand for a tough stance.

No way out

A remaining critical concern is that the current legislation is very poor in offering terrorists and their supporters a way out of extremism. There is no system to encourage terrorists to leave. Instead everything is focused on their capture and severe punishment.

In contrast, several countries have used legislation to facilitate pathways out of terrorism. Italy introduced highly successful *Penitenti* laws in the early 1980s, which provided reduced prison sentences and early release for reformed terrorists. These laws played a major role in defeating terrorism in that country. States such as Yemen, Egypt and Singapore are now experimenting with similar approaches to deal with jihadi extremists (and apparently with considerable success).

Psychology has long known that it is much easier to change behaviour with rewards than with punishment. The UK, though, shows no sign of introducing a carrot to accompany the many sticks in its legislative approach, and this omission may yet prove costly.

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Where did texting come from?

Alan Cox reveals all

Twenty-five years ago, it was easier to buy a Rolls Royce than a mobile phone. How things have changed!

In January 1985, Vodafone started service in the UK with analogue mobiles. This became very popular with millions of customers for the first time, and not just those in Rolls Royces! But it was primarily a mobile *telephone* service, with hardly any *data*. The many networks across Europe were incompatible, so it was impossible to roam – if you travelled, you left your phone at home.

GSM

Groupe Spécial Mobile (GSM) started as a political exercise, planned in the early 1980s, for a pan-European service across Europe, with the ambitious target of one million customers for the millennium. There are now over 1,700 million customers in over 200 countries and territories around the world.

GSM started as a committee of experts, first meeting in December 1982 in Stockholm. The committee's first task was to set the fundamental requirements of the system and by 1985 they had agreed on a digital service with integrated speech and data, allowing extra services to be built in. These were seen, in priority order, as facsimile, and modem services. Then someone thought of using spare capacity in the signalling for sending short messages.

SMS - texting

I was a founder member of the working group of the GSM committee which specified all the data services and was particularly interested

in SMS. The main use of SMS was seen as delivering alerts for voicemail and fax mail.

It uses a simple store and forward system. A message is sent to the Service Centre which then checks whether the destination is reachable (it might be switched off or out of coverage). If OK, it sends the message; otherwise it holds it until the destination is ready.

The basic message is of a standard size, to fill a single packet on early data signalling systems (272 bytes). Since GSM is a digital system, signalling messages, including SMS, can be sent in parallel to the traffic (eg speech). The original plan was for up to around 200 bytes of message plus the header, which, like an envelope, is needed to give the source and destination addresses. Unfortunately, the header started life as big as the content, so we had work hard to cut this down to size. We ended up with a message content of 140 bytes, organised as 160 seven bit characters (English alphabet) or 80 fourteen bit characters (covering every known language and alphabet).

The market place

Initial take-up of SMS was very slow – it was used mainly for voicemail alerts. It was not very popular for mobile-originated texting: the keyboard was tedious and networks didn't talk to each other. Customers would often not know which network was used by their intended recipient, so messages might not get delivered, although they would be charged for.

After several years in the doldrums, SMS suddenly took off. Why? We enabled networks to talk to each other, making delivery reliable. With pre-pay, younger people could have a phone in their own right. Youngsters have nimble fingers so could use small keyboards, while also inventing their own text language (no need to spell!) 'T9 entry', for adults who can spell, came later. Thus texting became easy to use and also to reply to, except while driving!

Text can now be sent from proper keyboards, not just small phones, so they may become longer than 160 characters. Messages can now be of any length by linking them together. And Multi-Media Messaging (MMS) adds a whole new dimension – messages can now be a thousand times larger. This allows the very popular addition of pictures and also of sounds. It goes much more quickly now we have 3G.

The services we imagined would be most popular have not turned out to be so. When did you last send a fax? We also thought that Cell Broadcast – a broadcast version of SMS – had many commercial opportunities, but these have not been exploited. The moral is that it is very hard to predict which services the customer will die for – the killer app!

Some Statistics

Over one trillion text messages were sent in 2005, of which over 12 billion were sent in China alone during the Lunar New Year holiday. Over three billion per month were sent in the UK.



Texting: to die for

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Physics in the City

Paul Bostock on a good investment

People are often surprised to find a former physicist employed as an investment manager and curious to know about the transition. My own career is an example.

Managing investments

Investment managers compete with each other for the privilege of managing funds that belong to private individuals, corporations, endowments and so on. Twenty years ago, investment management was done largely on the basis of well-informed intuition.

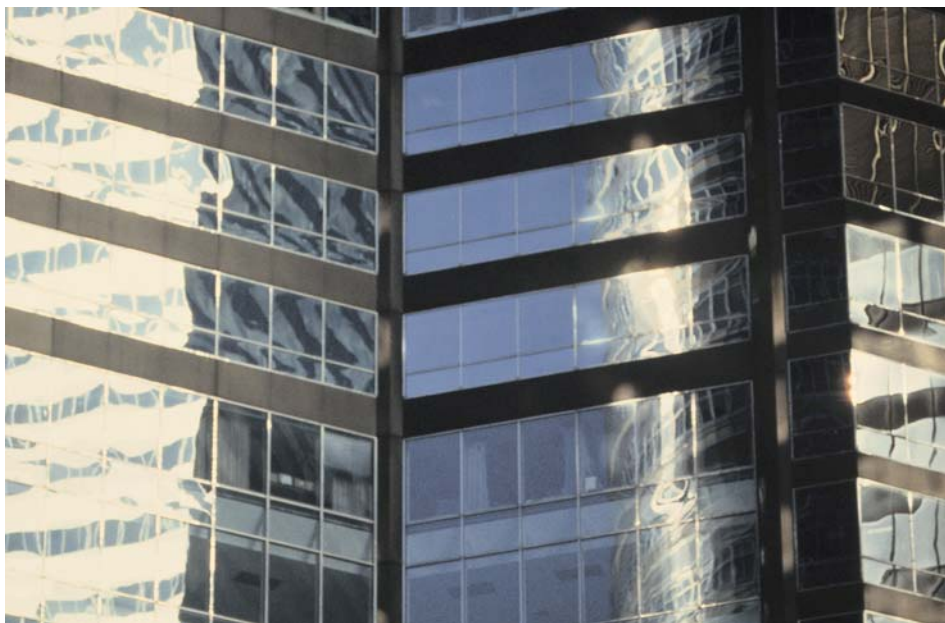
Since then there has been an enormous increase in the volume of data on shares and the performance of the companies, and this data has become highly accessible. At the same time, computing power has also increased, allowing the development of altogether more sophisticated investment processes.

A state of the art investment process is now capable of processing information on more than 20,000 companies worldwide. The information runs to hundreds of available items per company: turnover, profits, assets owned, long-term debts, cash flow, trading volumes and other costs, plus the history and variability of those measures over time, and so on.

From physics to finance

After completing a DPhil in physics, I started working in investment at Baring Brothers in 1985. I had little idea what I really wanted to do, save that it should provide a broad introduction to business. Baring's investment group had become interested in the new 'quantitative' finance – using mathematics to understand financial markets – and they wanted a graduate with computing abilities, a mathematical background and an interest in research.

Much of my learning was on the job. I began with some mundane tasks – I still remember building a global asset database over a few months, by typing hundreds of time series from booklets into spreadsheets. Later, as a fitting reward, I was able to analyse these time series and, for example, to explore the relationships between how investments performed in different countries. This led to the creation of some risk and return models for international investment. Having contributed to the analysis, I was also able



The City: golden opportunities for physicists

to participate in client meetings and began to learn more about what investors were looking for from their investment advisors.

Branching out

After two years, the director in charge of our group left to form a new company and I decided to go too. Although it seemed risky, I felt that being involved with starting a new firm would be a great experience even if it did not become successful. My last day at Barings was the day of the October 1987 hurricane and the following Monday, my first day at the new firm, was 'Black Monday', when the markets fell 20 per cent. Although it was odd having to find out what was going on from the radio news, it was at least a good day not to have clients.

I continued to look at international market valuations and became interested in how individual shares were priced. Research in these areas is certainly challenging – not conceptually perhaps, like physics, but because it is so hard to establish any definitively right principles to work from.

Soon I began to manage funds myself. This meant trading and keeping track of all the clients' positions. Although this was very enjoyable, it made less use of my strengths and after a few years I went back to spending more time on research, as well as by then helping to manage and run the business.

I remain particularly interested in the

challenges of valuing companies, which has become a richer subject as the amount of information has expanded. I am also keen to explore our understanding of risk, an area that I believe is ready for a breakthrough.

Science and investment

Scientists are often recruited to work on new models for evaluating opportunities or on risk controls (a particularly technical role). However, depending on personality and other interests, a scientist does not necessarily have a technical role, and science graduates often become involved in sales, business or people management.

Now that investment practice can fully reflect the best theoretical knowledge, we look forward to a new era which will advance the boundaries of the theory. So perhaps it is not surprising that science graduates – together with some highly numerate economists and MBAs – have been attracted to this area. Many are at the forefront of making these investment processes work.

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Young people and gambling problems

Mark Griffiths and Alison Linsey lay out the ground

There is no UK law preventing children and adolescents gambling on fruit machines in seaside arcades and family leisure centres.

However, there are many studies all showing that a small but significant minority of children and adolescents in the UK have a gambling problem.

Legislation

The most recent legislation is the Gambling Act 2005,¹ which will replace existing law on gambling in England, Scotland and Wales. This Act will not be fully implemented until 1 September 2007. Under 18s will be able to play gaming machines but only for a maximum prize of £5 (in cash or in kind), and a maximum stake of 10p (or 30p if the prize is not cash). The Act contains a provision for the Secretary of State to create an age limit for gaming machines and associated offences, after consultation with relevant bodies.

The 2005 Act also establishes a new independent Gambling Commission to license and regulate commercial gambling through casinos, bingo, betting, pool betting, larger charity lotteries and remote technologies such as the internet.

Prevalence of gambling

In 2000, successive surveys were commissioned by the National Lottery Commission² as part of an ongoing tracking survey to monitor young people's gambling behaviour.

The latest round of research found that 22 per cent had gambled weekly on fruit machines (55 per cent in the previous year), nine per cent had gambled weekly on National Lottery scratch cards (36 per cent in the previous year), and 7.6 per cent weekly on the National Lottery draw (26 per cent in the previous year). As with adult forms of National Lottery products, the prevalence of weekly play has decreased as the 'novelty' factor of playing has worn off. However, the prevalence of problem gambling among adolescents showed no significant decrease.

Problem gambling

The survey was also designed to identify the prevalence of 'problem gambling' by under-16s on the National Lottery, scratch cards and fruit machines.

There are many definitions of problem gambling, although most agree that the

consequences disrupt or damage family life, as well as work and leisure. The 2000 British Gambling Prevalence Survey³ found that just under one per cent of the UK adult population are problem gamblers (approximately 275,000-325,000 people). However, the proportion of problem gamblers is higher amongst 16-24 year-olds (1.7 per cent) than for over-25s (0.5 per cent). The problem gambling rate is two to three times higher in adolescents, particularly as a result of problematic fruit machine gambling.

The National Lottery Commission survey reported that 4.9 per cent of the sample were problem gamblers (3.2 per cent fruit machines, 0.5 per cent scratch cards, and 1.2 per cent fruit machines and scratch cards combined) which showed no significant difference from the previous survey (just over 5 per cent). These data suggest that although the prevalence of adolescent gambling decreased significantly between national surveys, the prevalence of problem gambling remained relatively constant and is a cause for concern.

Profiles of problem gamblers

The National Lottery Commission survey also found that problem gamblers were more likely than other children to have other addictive behaviours (for example, to have smoked cigarettes, drunk alcohol and taken illegal drugs in the past week). These are not necessarily causal factors of problem gambling, however.

Further research has shown that adolescent problem gamblers are also more likely to be male, have begun gambling at an early age, have had a big win early on, and to be from a lower social class. This research has also indicated that the most addictive gambling activities are those in which the time gap between gambles is very short (for example, slot machines), and there are short intervals between stake and payout, near misses, and a combination of very high prizes and frequent winning of small prizes.

Work for the Gambling Commission

Following the full implementation of the Gambling Act 2005, the newly established Gambling Commission will need to further monitor young people's gambling behaviours.

This should help to identify whether age



Young problem gamblers are more likely to be male

restrictions should be imposed on gaming machines, and examine the extent to which the gambling offences in relation to young people have been used. Further research is also needed into the adequacy of treatment and support for young people who are problem gamblers, as very few adolescent problem gamblers turn up for treatment.

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Deaf people and linguistic research

Bencie Woll welcomes a new Centre

I had a lot of punishments for signing in classrooms and at playground ... then one morning at assembly I was caught again, then, ordered to stand in front. The headmistress announced that I looked like a monkey ..., waving my hands everywhere. She [said] she will put me in a cage in the zoo so the people will laugh at a stupid boy in the cage.¹

In a world where speech and language are seen as the same, Deaf people have often been viewed as having a sub-human form of communication.

Despite records of British Sign Language (BSL) going back to the sixteenth century, and the status of BSL as the second most widely used indigenous language in Britain after English, Deaf people, their language and culture have often been ignored and disparaged.

The Deaf community

As with other minority language communities, the Deaf community can best be understood with reference to the surrounding hearing community. Membership of the 100,000-strong British Deaf community is characterised by attitudinal deafness (seeing oneself as distinctly Deaf, rather than as a hearing person with an impairment), marriage within the Deaf community, participation in Deaf social life, and use of BSL. The upper-case D is used to reflect these social and community choices – what has been termed ‘Deafhood’ – in contrast to deafness.

There are increased demands from the hearing community for courses in BSL and increased use of BSL in public contexts such as television

Research on BSL can not only illuminate this unique British minority community, but can also provide real insights into human language and cognition more generally. With the funding by the ESRC of the Deafness, Cognition and Language Research Centre, an enormous step forward has been taken in this direction.

The creation of this new Centre places Deaf



BSL: language without speech. *Fifi Garfield, DCAL*

people at the core of linguistic and psychological research. We will create new tools for assessing sign language and sign language development; describe the role of the face and gesture in language and develop our understanding of how language is processed by the brain.

We can already answer many of the most common questions about BSL.

Who invented BSL?

No one invented it, just as no one invented English. There are records of deaf people using sign language in Britain going back to the 1570s. Sign languages arise naturally wherever there are deaf communities – they weren’t invented by hearing people.

Isn’t sign language universal?

Just as there are many spoken languages – and for the same reasons – there are many different sign languages in the world (over 200 have already been recorded).

Aren’t signs just glorified gestures?

Both spoken and sign languages have their own unique set of rules for how words/signs are formed, combined, and understood, with nouns, verbs, the ability to indicate time, form questions, negate statements, and so on.

In spite of the difference in the channels

used for communication, there are striking similarities between the structure of spoken and sign languages. Research has also demonstrated that both are processed in the same areas of the brain.

Are signs just like pictures in the air?

Many signs do resemble the concepts they represent (they are ‘iconic’), but each sign language uses different icons. People learning BSL need to learn its signs, and this takes as much time and effort as learning a foreign spoken language.

Can you express abstract concepts in BSL?

All languages have the flexibility and creativity to meet new needs – the vocabulary of the language expands as new concepts arise. BSL is no exception. In recent years, new signs have appeared for ‘fax’, ‘wi-fi’, ‘genetics’, and so on. The assumption that BSL has inherent deficiencies in its vocabulary or has a simple structure is without basis.

Outlook for BSL

At the beginning of the 21st century, there are two contrasting futures for BSL. There are pressures, such as the move to mainstream education, and the possible decrease in the Deaf population as a result of medical intervention and advances in genetics. On the other hand, there are increased demands from the hearing community for courses in BSL, increased use of BSL in public contexts such as television, increased pride of the Deaf community in their distinctive language and culture, and new research. We hope that BSL will continue to be a living language.

References

1. Kyle & Woll (1985). *Sign Language: the study of deaf people and their language* Cambridge University Press, p. 263

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Food labelling in Europe

If national food labelling is complex, international regulation is an order of magnitude more difficult. The UK and the Netherlands held a conference in February to discuss uniform food labelling across Europe. Sabine Nafziger, Barbara Gallani and Chris Dabner lay out their concerns.

We need information for the majority

Minorities can consult websites, says Sabine Nafziger

When it comes to food labelling, the principles guiding the manufacturer are what must appear legally on the label; what information consumers really need/want/use; how consumers' needs can best be satisfied; and how we can communicate all the information clearly, ensuring that messages are understood and used.

Fulfilling all consumer needs and legal requirements for information on food labels often results in crowded labels. Quantity usually conflicts with the visibility of information.

Consumers are entitled to expect clear information, which is easy to find, read and understand. We can make information

clearer only by limiting legal requirements to information essential to consumers, enabling them to identify the product, to use it safely and to make an informed choice about its content.

Minority interests

Information for special consumer groups, representing minority interests, should be given by other means. These consumers should be able to obtain targeted information by establishing a dialogue with the producer. This is increasingly possible via websites. Other media, such as leaflets/brochures, free phonelines and in store-barcode-readers can also benefit consumer

target groups. Alternatives to websites are free phonelines or 'carelines.'

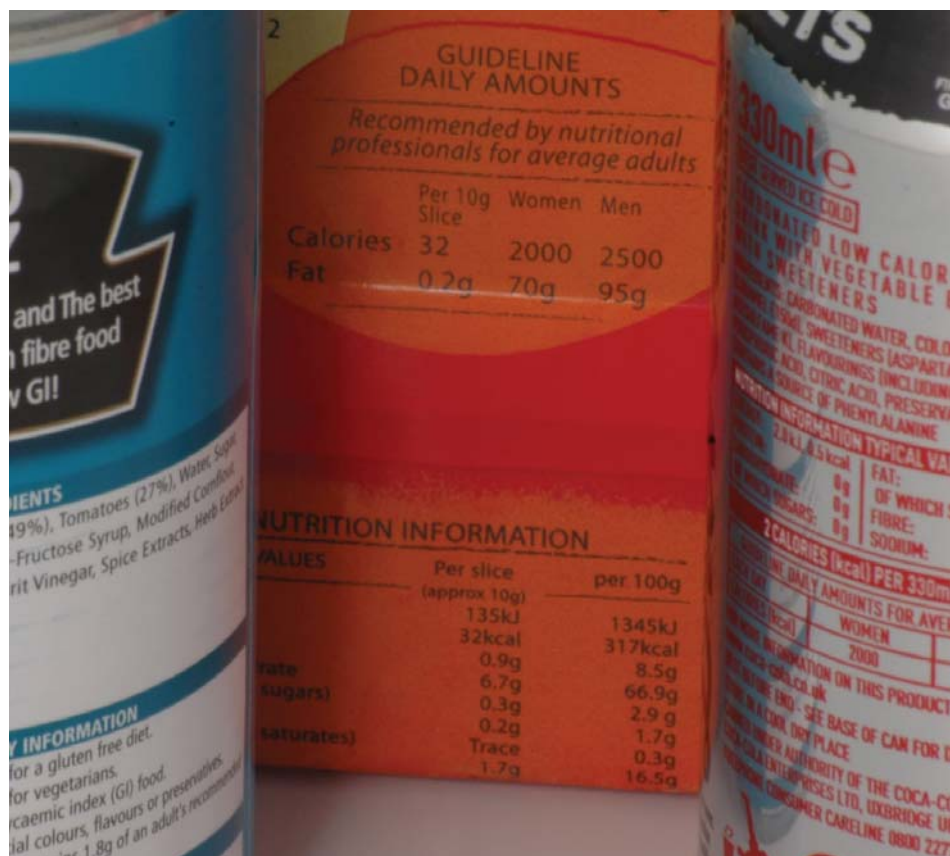
Increasing clarity and legibility of labels by concentrating on the essential information is only the first step. This has to be supported and accompanied by measures aimed at increasing consumers' understanding. We need to motivate consumers to read labels in order to make an informed choice. The necessary consumer education cannot be delivered through labels themselves.

Law needs simplifying

The quantity and complexity of food labelling legislation also presents difficulties for the industry, which has to comply with it. We need simplification, which means making the legislation more user-friendly for manufacturers by requiring less information and collating requirements in one piece of legislation. This should go in parallel with making sure that Member States cannot interpret the legislation differently.

The legislator should also take into account the problem of space for multilingual labels and small packages. The statutory information has to fit on packs of all shapes and sizes, which is another argument for concentrating on essential information, which is intended for the majority of consumers.

The harmonisation of those essentials, in clear and enforceable legislation, is of course necessary for intra-community trade.



Europeans disagree about what it should say on the tin

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We want nutrition labelling

without using magnifying glasses, declares Barbara Gallani

Consumers are very interested in nutrition and are trying to follow a balanced diet. They would like nutrition information on labels and find the current way of displaying information frustrating and difficult to read and understand. These are the findings of a BEUC survey of 3,000 consumer perceptions of food labelling in five European countries (Germany, Denmark, Spain, Poland and Hungary) last year.

Under current legislation, nutrition labelling does not have to be provided on all products. Consumers across Europe are often faced with nutrition information that is either lacking or not detailed enough.

The labels may not be clear – terminology and presentation can be confusing, for example ‘sodium’ and ‘salt’ can be used interchangeably even if they are not. And labels are very hard to read. We should not have to dig out our glasses, or sometimes more likely a magnifying glass, to read the small print and to cope with the very poor colour

contrast (pale pink on white, green on transparent packaging containing green peas!).

Moreover, figures are difficult to put into context. Often it is not easy to understand whether, for example, 2g of saturated fats in a small snack eaten in between meals is a lot or a little (in fact it is a lot, considering that a woman should not eat more than 20g of saturated fats each day and that saturated fats are present in many of the foods we eat).

Websites no alternative

The information found on labels, as long as it is legible, is one of the main sources of nutrition information, used by between 40 and 60 per cent of consumers, depending on the country.

Information provided by food companies either on the internet or through freephone numbers appears to be used by less than 2-3 per cent of consumers and therefore cannot be considered as a viable alternative. We believe it is necessary to improve the labels and make them more meaningful for consumers.

Consumer demands

Consumer organisations across Europe have been campaigning for a number of years to improve the nutritional information on food labels. We ask for a minimum size of lettering and clear rules on contrast to be set.

We also ask for mandatory nutrition labelling of the ‘big eight’ (energy, protein, carbohydrate, sugars, fat, saturated fat, fibre and salt) as well as appropriate labelling of trans-fatty acids for all processed foods. We also support the harmonised use of front-of-pack simplified labelling to help consumers better understand and quickly judge the nutritional quality of the food they want to buy.

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It’s a mess

Small businesses are confused, asserts Chris Dabner

Whilst necessary for the free movement of goods, the present very complex regulations on food labelling are themselves a barrier to trade for small and medium enterprises (SMEs), who find them difficult to understand and comply with.

Labelling and labelling changes are expensive. They need technical expertise, resources and significant amounts of time, all of which cost money. SMEs often have to outsource their labelling at a disproportionate cost.

However, most food sold is not traded between Member States!

Other ways of communicating

Comprehensive labelling is just one means of providing information. Other means of providing the information, for example web sites, freephone lines, leaflets are beyond most SMEs.

However, vast amounts of food are sold non pre-packed or pre-packed for sale direct to the consumer by producers, manufacturers or specialist retailers, who are usually SMEs.

In these situations, the consumer can ask

Article 14 of Directive 2000/13 allows Member States to decide in such situations what information is really necessary and has to appear on the product or on a label/notice nearby. Usually only minimal information is required.

Consumers appear happy as the number of markets, farmers markets, farm shops are increasing. This ‘derogation’ is extremely important for SMEs, who comprise 99 per cent of all food businesses and generate around 50 per cent of the turnover in the food sector.

Simplicity?

At the food labelling conference in February, the suggestion for uniformity was linked to simplification.

There are some fundamental problems and contradictions that need to be resolved.

Industry is continually being told that consumers want more information, for example country of origin and nutrition; but that there is already too much information on the label. We are being told that consumers don’t understand it, and that they want labelling that is simpler,

easier to read and understand.

It is unclear what is wrong. Detailed research is urgently needed.

Want vs. need

When producing the labelling legislation, no distinction appears to have been made between ‘want’ and ‘need.’ Information is provided because a certain group ‘wants’ it, but there is no real ‘need’ for it.

Nutritional information is provided on 89 per cent of all pre-packed foods in the UK, yet only nine per cent require it by law. However, there is still a major problem with obesity. So just providing more information is not the answer.

Legislators need to decide what information is important and must be provided. It must also be useful and be used.

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Mobile phones and children

Mobile phones increasingly have enhanced features such as colour screens, picture messaging, video cameras and internet browsers. These have raised fears that children using mobiles may be at risk from unsuitable material. The major mobile phone operators have developed and signed up to a voluntary Code governing new types of content, which aims to protect children. Phil Willis and Will Gardner discuss its usefulness, alongside excerpts from the Code itself.

Voluntary Code

It may not be working, argues Phil Willis

With 5.5 million mobile phones in the hands of young people, it is small wonder that mobile operating companies see the young people's market as critical to their future prosperity. Today's generation of young people are the most technologically advanced in history and most see the mobile phone as an essential item of personal equipment.¹

The mobile phone is liberating for young people; it is educative; it offers personal security to the user and comfort to anxious parents. So why am I urging caution on behalf of the All Party Mobile Communications Group in Parliament?

Caution

I accepted the advice of Sir William Stewart, Chairman of the Government's Health Protection Agency, who urged caution, saying that young children could be more vulnerable to undiscovered effects of mobile phones. The advice that he would not allow his eight year-old grandchild to own a mobile phone seemed sensible. Indeed all the mobile operators agreed that they would not market phones to primary-age children and even agreed a Code of Practice to back up their commitments.

Despite their best endeavours, one in four children under the age of 10 possesses a phone and at least two companies (Orange and O₂) are believed to be entering into agreements to market services that will be extremely attractive to young children. In the case of O₂ a link-up with Disney would bring Disney content direct to the children's market.

The companies claim that their products are not aimed at the under 12s, but quite frankly if they believe that young children will not quickly see the attraction of Disney products available to their mobile phone then

they underestimate the continuing power of the Disney brand.

Direct marketing?

Should Disney succeed at penetrating directly into the children's market, every other operator will follow suit, fearful of losing this growing market. The mobile operators may well claim that it is not direct marketing to offer an attractive service that by default happens to appeal to a younger audience; but I doubt others would see it that way.

Orange and O₂ are believed to be entering into agreements to market services that will be extremely attractive to young children

The Code should be honoured in its spirit by all operators. If that cannot be achieved, regulation by statute will be the only answer. What is more, if the voluntary agreement cannot enforce such simple agreements, what hope has a voluntary agreement to control the ever growing threat of access via the mobile phone to unsuitable internet content?

Reference

1. See Helen Haste, *Joined-up Texting: the role of mobile phones in young people's lives* (Nestlé Social Research Programme, 2005)



Mobile phones are part of young people's identity

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Children face risks

Code not empowering, warns Will Gardner

There are potential risks facing children using new mobile services. We have classified the main potential risks to children in this space as Content, Contact and Commercialism:

- Content – exposure to potentially harmful content such as pornography, violence, or racist material or other inaccurate information
- Contact – adults with a sexual interest in children making inappropriate contact with children in interactive services, and also bullying
- Commercialism – issues here include privacy protection, direct marketing, and the blurring of the distinction between advertising and editorial.

Always available

The nature of the mobile device makes the internet and other services inherently riskier for two main reasons. First, the private and personal nature of the mobile device; the mobile phone is the ultimate in personal and private communication, which makes parental supervision impossible.

Second, the fact that the mobile phone is always on. The whole point of having a mobile phone is to be able to be contacted and to

contact others at any time. Children are thus always potentially reachable and potentially vulnerable.

We are facing the situation where not only do most children and young people have mobile phones, but mobile phones have become an essential item for this age group. One 15 year-old girl said to us, 'If you took away my phone you would take away a part of me,' clearly illustrating how important the phone had become in her everyday life.

Code not heard

The Code of Practice agreed by the UK mobile operators to provide parents and carers with safety tools and safety advice is not effectively reaching its target audience, and we need to do more to educate and empower parents¹ and children so they know how to use this technology safely.

Childnet International has been working to help make the internet a great and safe place for children for 11 years, and we have recognised that children can be made vulnerable by technology.

In our document 'Children and Mobile phones: An Agenda for Action'² we outline who needs to be involved and what we need to do

to help children get the most out of this technology and keep safe. All sectors – schools, government, law enforcement, mobile operators, content providers, product developers, retailers, as well as parents and carers – need to consult with children and young people themselves, understanding each sector's viewpoints and challenges, and work constructively to ensure that children are protected and able to really benefit from the new technologies.

References

1. The need to inform parents in this area has been made clear both in Childnet's experience, in the emails we receive from parents and also in discussions we have with parents during our parents seminars (see www.kidsmart.org.uk), and also was found in Ofcom's recent Media Literacy Audit: Report on adult media literacy, p62: see <http://tinyurl.com/ml84b>
2. See http://www.childnet-int.org/downloads/CMPAAA_A4.pdf.

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UK code of practice¹

Excerpts from the voluntary Code

Commercial content

Mobile operators will appoint an independent classification body to provide a framework for classifying commercial content that is unsuitable for customers under the age of 18. The framework will be consistent with standards used in other media and only treat as 18 content that would receive an 18 type classification for the equivalent material in, for example, magazines, films, videos and computer games...

- By default, all commercial content not classified as 18 will be unrestricted.
- Each mobile operator will place commercial content classified as 18 behind access controls and only make it available to those customers that it has satisfied itself, through a process of age verification, are 18 or over.
- The mobile operator will also place behind access controls all commercial content chat rooms, unless they are moderated chat rooms.

Internet content

Mobile operators have no control over the content that is offered on the internet and are therefore unable to insist that it is classified in accordance with the independent classification framework.

Mobile operators will therefore offer parents and carers the opportunity to apply a filter to the mobile operator's internet access service so that the internet content thus accessible is restricted. The filter will be set at a level that is intended to filter out content approximately equivalent to commercial content with a classification of 18.

Illegal content

Mobile operators will work with law enforcement agencies to deal with the reporting of content that may break the criminal law...

Unsolicited bulk communications

Mobile operators will continue to take action

against unsolicited bulk communications (i.e. spam), including text messages, picture messages and emails.

Information and advice

Mobile operators will provide advice to customers – including children, parents and carers – on the nature and use of new mobile devices and services and support other relevant media literacy activities designed to improve the knowledge of consumers. Information on the Code will be available on the website of each mobile operator.

Reference

1. See <http://tinyurl.com/hxqj4>

The UK Mobile Operators Code of Practice for the self-regulation of new forms of content on mobiles has been developed and signed by Orange, O2, T-Mobile, Virgin Mobile, Vodafone and 3

Science meets policy

Zitouni Ould-Dada reflects on a European event

Researchers and policy-makers throughout the enlarged EU need to engage more on environmental policy.

This was one of the outcomes of a recent workshop in London, which brought together representatives of 18 European states to explore how science could better be used in environmental policy-making.

Taking a fresh approach

The workshop followed a series of 'Science meets policy' events which started in 1998 on the relationship between science and policy in the environmental domain in Europe. Following the recent EU enlargement, we need to take a more general overview of how the science-policy interface is developing across Europe.

Before the event, the sponsors commissioned a review of the way the relationship between science and policy is developing across Europe. The findings from this study provided a focus for the workshop, which considered two key questions: how to improve linkages between policy needs and research programmes, and how to make scientific knowledge more accessible to and useful for policy makers.

The workshop identified three areas for action:

1. Engagement between scientists and policy-makers

The priorities here are to

- *Create incentives for researchers and policy-makers to engage with each other*
Research funders should consider providing funding for this, and recognise the necessity for engagement and inter-disciplinarity. They should create a 'policy citation index' to track the policy impact of research and the quality of policy-makers' use of evidence
- *Policy-makers to seek dialogue with researchers throughout the policy cycle*
Ensure systematic evaluation of the impacts of policies; review long-standing policies in the light of new evidence
- *Support training, education and secondments*
Train scientists in communicating with non-scientific groups; educate policy-makers on the use of scientific evidence in policy-making

- *Support inter-disciplinarity*
Create inter-disciplinary research programmes; ensure inter-disciplinary research is not penalised in project selection, publication and research assessment; provide seed funding for researchers to put together inter-disciplinary teams and proposals
- *Maintain a longer-term perspective*
Support long-term and independent research and environmental monitoring.

2. Planning and managing research programmes

- *Identify clear policy needs for research*
Policy-makers need to identify their research needs and ensure that these influence other current research programmes
- *Engage with stakeholders*
Researchers should engage with a broad range of stakeholders throughout the research process; invite stakeholders onto research steering committees; seek out policy 'mentors' to create links into policy networks and processes; and gain an understanding of how policy processes work.

3. Dissemination and uptake of research

- *Express science accessibly*
Support for people and organisations who can 'translate' scientific information and ideas into more accessible language
- *Synthesise knowledge*
Policy and research organisations should support intermediaries to synthesise available information relevant to current policy questions
- *Communicate with non-academic audiences*
Research projects should dedicate a proportion of their budget to communicating with stakeholders; explore making science more accessible by using 'science cafes' and working with media specialists
- *Be transparent*
Research evidence used in policy needs to be subjected to quality control (for example, peer review); uncertainties in research results need to be acknowledged and clearly identified; policy processes need to be transparent



European environment policy: water conservation in the Netherlands

so that all can see the evidence used, the assumptions made, and the questions asked

- *Set up databases*
Research results need to be made accessible to policy-makers in databases in plain language and in searchable format.

Implementation

These ideas are being implemented with colleagues from the European Commission. They are also feeding in to European initiatives exploring the link between science and policy (for example, the Scientific Knowledge for Environmental Protection project: SKEP ERA-NET¹), and the hosts of the next event. Some of these recommendations are for the individual Member States to act on as well.

The event was organised by the Department for the Environment Food and Rural Affairs (Defra) as part of the UK Presidency of the European Union, and was co-sponsored by Defra, the Natural Environment Research Council and the Environment Agency. It was launched by Professor Howard Dalton, Defra's Chief Scientific Adviser, and chaired by Professor Sir John Lawton, chairman of the Royal Commission on Environmental Pollution.

Reference

1. This project is funded by the Sixth Framework Programme. See www.skep-era.net/site/2.asp

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The self-sorting tendency

Roger Burrows fears software might divide society

Previous research has demonstrated how important neighbourhood images can be. They influence both the lives of local residents and the attitudes and behaviours of others with the power to invoke neighbourhood change.

However, the sources of such neighbourhood imagery are fundamentally changing. This will necessitate dialogue between groups of people who have had little engagement with each other: the geodemographics industry; software designers; commercial and public sector software providers; those concerned with housing, neighbourhood and regional policy; and those concerned with the design and roll out of e-government.

From local to global

Images and perceptions of neighbourhoods and communities used to be generated from a range of primarily local sources. Local residents and those living nearby would hold key information about the history and folklore of particular places. Much of this was verbally communicated.

The state and commerce also collected more systematic statistical and other data on neighbourhoods but, for the most part, this was not available to the general population.

However, the *technological* means by which neighbourhood images are now constructed, disseminated and consumed has undergone a revolution in recent years. With the emergence of numerous Internet-Based Neighbourhood Information Systems (IBNIS), any member of the public with access to the internet can quickly and easily gain huge amounts of detailed information.

UK resources

In the UK, commercial websites such as www.upmystreet.co.uk and www.homecheck.co.uk provide a plethora of statistical, geodemographic and environmental data down to the level of individual postcodes. National Statistics, through its site www.neighbourhood.statistics.gov.uk, provides detailed official data on a huge range of topics. In addition, www.upmystreet.co.uk provides a 'conversations' service where lay people 'on the ground' can comment on the social life of particular localities.



Tell me where you live and I'll tell you who you are

Alongside these 'data-driven' sites, others – which might have a humorous intent (such as www.craptowns.co.uk and www.chavtowns.co.uk) – provide more informal (and usually negative) qualitative observations on places.

Similar sources exist in the USA. Much of the information is derived from powerful statistical and geodemographic data developed by marketing companies.

Sorting software

Developments in IBNIS need to be set in the context of the increasingly important role that software plays in contemporary societies, particularly in urban environments. We need to take seriously the need to analyse the relationship between 'physical' urban spaces and the digital technologies that are increasingly shaping understandings of these spaces.

Access to digital technologies is socially uneven – leading to a basic social divide between the 'information rich' and the 'information poor.' Recent debates have examined how technologies like IBNIS are themselves beginning to divide and sort populations in a manner that enhances the socio-structural position of certain groups while disadvantaging others.

Geodemographic sorting technologies deliberately segment populations, classifying them according to a range of commercial and governmental requirements, and even according to individual tastes and consumer preferences, likely lifestyle habits and so on. While such classification of people and places is hardly new in itself, sorting processes have been much enhanced by the new technologies and are increasingly widespread.

Self-selection

Until recently, such sorting has been largely invisible to the public. With the emergence of IBNIS, though, there is the possibility that it will no longer just be commercial and policy interests that are engaged in such activities. It is entirely plausible that some members of the public will be motivated to 'sort themselves out.'

The question for the future is whether IBNIS will assist in the production of increasingly separated spaces where neighbourhoods – as defined by software programmes – will come to be more homogeneous within themselves and more diverse between themselves than would otherwise have been the case.

Safeguards

There is nothing new in recognising that social divisions possess a strong spatial element. However, the emergence of IBNIS adds a powerful new means of 'segmenting' places. Obviously, whilst no one would want to prevent the public availability of neighbourhood information, it would be as well to be alert to the implications that IBNIS might have for vulnerable neighbourhoods and populations.

Certainly, at a very minimum, it might be sensible to ensure that IBNIS provide mechanisms by which local people (and others) can challenge the manner in which their neighbourhood is characterised. Also, that IBNIS make their sources of local information explicit, in addition to making clear how the information was compiled.

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And then there was one

Sam Turvey contemplates Lonesome George

Lonesome George: the Life and Loves of a Conservation Icon
by Henry Nicholls (Macmillan, 2006)



George: madly gay?

Conservation is never simple, but the situation becomes increasingly desperate when endangered species decline to the last few survivors. These sorry individuals, sometimes lingering for years in captivity, have often been elevated to celebrity status by their human observers.

Martha, the last passenger pigeon, and Benjamin, the (possibly) last Tasmanian tiger, focus our environmental guilt and make extinction feel personal, and in doing so have acquired tremendous posthumous fame. However, these extinct A-listers all lived and died before the development of modern conservation attitudes.

In today's more ecologically enlightened and scientifically capable age, can we do any better when dealing with other species of extreme rarity? The fascinating story of Lonesome George, the only surviving Pinta tortoise (*Geochelone nigra abingdoni*), shows how far we still have to go.

George discovered

The giant tortoises of the Galápagos archipelago are one of the classic examples of evolution, having developed into different subspecies with distinct shell shapes in

response to conditions on different islands. However, as with many other insular animals, they have been severely impacted by human activities.

The practice of hunting tortoises as provisions for long sea voyages wiped them out on Santa Fe, Floreana and Fernandina, and a lack of any tortoise sightings after 1906 from the remote island of Pinta led scientists to fear the worst for this population as well.

However, in 1971 a biologist searching for snails on the island came face to face with a solitary tortoise, eking out a living in competition with 20,000 feral goats. This lone male – named after the American comedian George Gobel – was quickly relocated to the Charles Darwin Research Station (CDRS) on Santa Cruz, where he has been a major tourist attraction and unwitting flagship for conservation ever since.

Unresponsive George

George's discovery and subsequent life at the CDRS are now the subject of a biography by science writer Henry Nicholls. George himself has remained relatively healthy (bar a slight thyroid problem) and has done very little for the past few decades. However, his lack of interest in female tortoises has hindered attempts to preserve any Pinta genes for future tortoise generations – and has even raised questions about his sexual orientation.

The book is full of fascinating facts about the sexual lives not only of tortoises but also many other animals

As Nicholls engagingly reminds us, our knowledge of stimulating tortoise reproduction remains limited, and we are still 'struggling with the whims of reptilian semen.' Indeed, the book is full of fascinating facts about the sexual lives not only of tortoises but also many other animals, which are as fun to read as they must have been to write. One learns, for instance, that touching an elephant's penis during artificial stimulation is 'not helpful' for those valuing their personal safety.

Conservation critique

Nicholls ably illustrates the exhaustive conservation efforts now in place to prevent the decline of other Galápagos tortoise populations, and also the dilemmas faced by managers at the CDRS, but he is critical of some of the decisions made about George.

Now that we know he is most closely related to tortoises from the distant island of Española, why have no Española females been encouraged to mate with him? And could more efforts have been made to stimulate George's mating behaviour and cryopreserve his sperm?

Even Charles Darwin himself doesn't escape criticism – he displayed a cavalier attitude to Galápagos wildlife when he visited the archipelago, didn't recognise the evolutionary significance of the tortoises, and helped eat several of them.

More recently, George has been the subject of death threats as a result of acrimonious disputes over the region's sea cucumber fishery.

Extinction and recovery

Nicholls does George proud in this enjoyable book. He also finds room to describe wider conservation issues such as the consequences of tourism and population growth in the Galápagos, and the problems faced by evolutionarily innovative but ecologically fragile island faunas.

In our modern era of biodiversity loss, increasing numbers of other species – such as Spix's macaw, the ivory-billed woodpecker and the Yangtze River dolphin – are in danger of dwindling to extinction long before George. He himself is likely to live on for many more decades, even centuries, and so it is quite possible that future technological advances will be able to engineer the recovery of the Pinta tortoise.

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Joys and duties of a scientist

Dear Editor,

How strange that talking about your profession and passion should be counted a chore! (John Warren's 'Sounding Off', S&PA, March 2006.) Being able to say what they do is a duty for scientists as it is for other consumers of public money (as most scientists are directly or indirectly). But scientists are uniquely fortunate that this duty is, for many, also a joy.

As a journalist and author, I have had occasion to interview professionals in many fields, and it's always been a pleasure to find most scientists in possession of an abundant childlike enthusiasm for their work. It makes a refreshing contrast from talking to people in business and government.

Long may this ingenuousness remain. We should be careful that something important is not lost with the pressure to make scientists 'media savvy' now. I cherish this innocence. Refusniks like Dr Warren must perhaps prepare to suffer the consequences of their failure to communicate, but wouldn't it be easier to discover instead the joys of talking.

Unrealistic expectations

Dr Warren's problem is that he sets unrealistic targets. Before he's prepared to talk, he wants his interlocutors scientifically trained to his level of expertise in his discipline. And before he'll talk, he wants cash.

Let's dispose of the second of these. Pay is not the answer to everything, and it's certainly not the right incentive to replace what should be a natural enthusiasm to talk anyway. With this attitude, what scientist is going to communicate anything worth a damn?

The first objection is more serious, and also more wearily familiar. Scientists should be able to explain. They have to explain what they want to do to funders; they should equally be able to explain what they've done to the public, who one way or another provide the funding.

The public, on the other hand, have no corresponding duty to be scientifically literate. Sure, it would be nice if they were – if possibly considerably more challenging to some scientists. But it's simply not realistic to make it a prerequisite for dialogue. (Incidentally, Dr Warren complains instead that 'the public are happy to confess their ignorance', yet surely a scientist above all should regard confessing ignorance as a virtue, not a shortcoming.)

This lack of qualification should not debar



Say it with passion!

the public from expressing opinions or even suspicions. Scientists who think it should may understand how to run an experiment or a laboratory but don't understand how society works. In a democracy, a person is just as entitled – entitled, not qualified – to voice an opinion on scientific affairs as on social, economic or political matters. Scientists need to understand this.

Understanding communication

The public may not be qualified to understand science, but they are qualified to understand scientists. Just as much human communication is contained in the looks and gestures that accompany words actually spoken, so the non-scientist can potentially understand much aside from the strict content in science communication.

I recently published a book called *Findings*. It shows what a non-scientific reading can still tell an ordinary reader, not a scientist, in a scientific paper. It's the kind of thing that irritates some scientists, daring to suggest that the unqualified public might inspect their primary literature. But I think it's a public right for us to do so.

Such skills are increasingly needed. Not all

scientists now speak to the media in the naive old spirit, and we all need a sceptical ear when we listen to them as we do with everyone else. In future, the scientist who doesn't talk, as well the scientist who talks defensively or evasively, will be regarded as suspect (just as is a politician or business leader acting likewise).

We're not there yet. Scientists are still largely respected by the public, and they remain by and large naive in their communication – they say what they know and what they think without affectation. This unspun speaking is a good thing. It stems from natural enthusiasm and from having nothing to hide, and this at least is sensed by the non-scientific public. Scientists who begrudge a few words about their work risk damaging the whole of science in the public's eyes.

Hugh Aldersey-Williams is a science writer and curator. *Findings: Hidden Stories in First-Hand Accounts of Scientific Discovery* is published by Lulox Books, www.luloxbooks.co.uk hughaw@identi.demon.co.uk

Scientists in the pay of industry

Lazy journalists jeopardise informed debate, alleges Fiona Fox



Journalists' attacks undermine vital expertise

A striking aspect of the media's coverage of science in recent years is the growing trend to 'uncover' and 'expose' scientists' links with industry.

Intrepid investigative journalists delight in shocking us with the news that a string of independent scientists advising us on some of the hottest topics of the day are in the pay of industry and, by implication, not to be trusted.

We've seen an entire scientific advisory panel on GM crops written off because their members have ties to industry; an attack on a highly respected MMR expert because she happened to be on the same side as vaccine manufacturers in a legal challenge and, most recently, the accusation that almost every leading scientific body involved in the obesity debate is in hock to the food companies.

The problem with these so called 'exposés' is that the journalists don't feel the need to come up with the proof that a link with industry has corrupted the independent scientist, relying instead on the public's suspicion of industry to get away with guilt by association.

Naïve about science

For scientists the attacks are bewildering, appearing to combine an attack on their integrity with a naivety about the way science is done in the UK. It's a fact of life that there is more research needing to be done than public

money to fund it.

A lot of science would simply not be done without some collaboration between industry and independent scientists. Universities now have to find substantial sums from the private sector if they are to unlock government funds for research and even the Research Councils, who are on the more blue-skies end of scientific research, are being encouraged to forge closer links with industry.

According to Colin Blakemore, Chief Executive of the Medical Research Council, the whole concept of an independent scientist is a misnomer. 'Although the public repeatedly tell us that they trust independent scientists more than those in industry, the reality is that as a species the truly independent scientist is becoming extinct. But the idea that because a scientist has some links with industry they are automatically tainted and evil is just ridiculous,' he says.

Hidden facts

There are other relevant facts that fail to show up in the exposés, like the written agreements which allow the scientists to publish irrespective of the results. And the small matter of 'peer review', described by one scientist as 'the best bullshit detector ever invented', that ensures that research doesn't get published unless it passes a number of quality control tests applied by

independent experts.

Of course the media's role is to expose corruption and bias in science, and if and when the media find evidence that scientists have allowed commercial pressures to influence their research it should be splashed over the front pages. But proper investigations like this are way outnumbered by the 'shock-horror' articles that expose nothing but the laziness of the journalists.

Real topics

Ironically there are other issues in this area that are crying out for investigation but have been largely ignored by the media.

These include the concerns raised by leading scientists like Nobel Prize winner John Sulston and fertility expert Robert Winston, that the commercial collaborations with our universities may be having a long-term impact on academic freedom and blue skies research. Or whether the rush to create spinout companies is turning innovative scientists into businessmen with more of an eye on the share price than the public good.

But these topics demand serious journalistic investigation – a thing in short supply in our fast-moving 24-hour news environment.

Why bother?

I suppose the really big question is why it matters. So what if a few scientists are suffering from bruised egos – surely it's the price they pay for supping with the corporate devil? I think it matters hugely.

Media attacks on the independence and integrity of scientists working with industry threaten to undermine the kind of expertise that is absolutely crucial to public debate on controversial issues like childhood vaccination and the safety of GM crops. If we cannot hear from the very people who have built up a huge body of knowledge based on painstaking research and enquiry, then we as a society lose the ability to have a truly informed debate.

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Creationism reviving; science recruitment declining

Tom Wakeford argues the two are linked



Tom Wakeford

Fearing a US-style revival of religion as an alternative to science, the Royal Society recently decided to oppose the teaching of Creationism and intelligent design in UK schools. Some of the same celebrity scientists backing this position are also speaking out against the closure of university science departments, despite evidence that there is an ongoing decline in the number of school leavers wanting to study their courses.

I think the two issues are connected.

A few years ago, a professor in a leading UK university contacted my research team to see whether we could help reform their increasingly unpopular physical science undergraduate degrees. We suggested what we felt were some common sense reforms – making the relevance of the science to social and environmental problems explicit from the first lecture, and sacrificing some of the rote-learning of ‘basic’ facts for a more problem-based synthetic approach.

Our proposals were never acted on. We heard reports that *les eminences grises* had dismissed them as a step backwards. They would rather stick to the traditional approach, and hope the students eventually saw the light. This year their vice-chancellor announced that recruitment had nose-dived further, and that their whole department was to be closed.

Moral emptiness

Though the lack of attractive and well-paying careers may be one cause, the fall in demand for science courses is also linked to a sense among young people of a moral emptiness

in traditional science.

For much of the twentieth century new generations struggled, often against the odds, to have a career in science because they believed that more science would mean greater social progress. Today’s youth see a political system that seems unable to address rising poverty or runaway climate change. They rightly conclude that solving scientific puzzles or inventing new gadgets alone is unlikely to save the world. This is where religions such as Christianity and Islam, with their strong emphasis on social justice, are coming back to haunt the rationalists.

The teaching of Biblical accounts of humanity’s origins as having an equal factual basis to biological evolution is, as Britain’s teachers voted this spring, nonsensical. Yet few of the sofa scientists acknowledge the need to understand the causes of the revival of Creationism, not merely condemn its consequences.

Selfishness and solidarity

The quasi-religious belief in the selfish gene by the political class in the UK also helped lay the ground for a return to Creationism. Richard Dawkins justifies unfettered free-market capitalism as if it naturally follows from the laws of nature; and despite New Labour’s tinkering, these ultra-Darwinists have helped create a culture that values the pursuit of individual gain above all else.

The fall in demand for science courses is also linked to a sense among young people of a moral emptiness in traditional science

So should young people believe that selfishness or solidarity is at the heart of humanity? In contrast to their prominence elsewhere, I didn’t see many selfish gene advocates taking a leading role in *Make Poverty History* last year. Like the then-editor of *Science*, Daniel Koshland, maybe they think poverty is ‘in the genes.’ Most scientists who are prominent in the media make a virtue of the amoral nature of scientific inquiry. Yet

most young people realise that science conducted without a valuing of the very unselfish concept of universal human rights leads to eugenics and gas chambers.

Initiatives

Economics used to be called the ‘dismal science.’ Maybe all sciences have to become less dismal, and more moral, if they are to inspire young people again.

The Hippocratic Oath for Scientists recently launched by the Council on Science and Technology was a step in the right direction

There are some exciting new initiatives that seem to be moving in this direction – such as the University of Plymouth’s Holistic Science degree, or the University of Strathclyde’s collaboration with the Centre for Human Ecology. Even the Hippocratic Oath for scientists recently launched by the Council on Science and Technology was a small step in the right direction.

Some among a new generation of scientists give me hope about the future of our profession. They are modest about the certainty of their knowledge and open to including broader perspectives in their judgements than those that come out of the laboratory. But by living out the saying that ‘it is not new ideas that triumph, but old professors who pass away’, Britain’s celebrity spokespeople for science are holding us back. They are making the public think that nothing fundamental about the way we do science needs to change.

Tom Wakeford

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All hail the new Science Supremo

Ian Gibson extols the Chancellor



At last, the Chancellor of the Exchequer in his recent 'science' budget¹ has made the opening moves in removing us from our complacency and self-congratulatory slumber.

His plea to prioritise investment in science, technology and engineering, to deliver 'our whole economic future and future well-being' utilising the skills of our nation, has laid down the gauntlet science has needed from politicians.

Universities must be well funded, co-operative not competitive (away with the Research Assessment Exercise!) and all our industries must increase their investment in research and development. It is time that these two major players got together to ensure meaningful collaboration, and not just the odd granting of a Professorship or Studentship to give credence to their mutual admiration.

The two sides need to engage in a serious dialogue, independently of Whitehall interference, to come up with a British Strategy for Science, Technology and Engineering, and that will mean international collaboration.

Still to do

Whilst we can celebrate the increased funding extolled by the Minister of Science and Chief Scientific Adviser to the Prime Minister and their apparatchiks, we fail to have seriously delivered the benefits which ought to have accrued from our strong scientific inheritance

and talents of our young people who, in the main, carry out the research. We lag behind in our innovatory skills and in delivering the parts of this complex process.

We must feed our young minds on a diet of laboratory experience and promulgation of 'crazy' independent thought and discussion

We need a scientific voice in this country which recognises the poor science schooling our people get. Again the Chancellor, the new spokesperson for science, has recognised this.

As the author Ian McEwan has pointed out, there is a condescension to the layman which the theme of Richard Dawkins in the *Selfish Gene* has overcome. He talks in a language which is penetrating and recognises the history of science, which did not start in 1953 with the discovery of the structure of DNA or later with the sequence of DNA. Science builds on experiments which allow us to re-interpret earlier hypotheses.

We must feed our young minds on a diet of laboratory experience and promulgation of 'crazy' independent thought and discussion. In such an environment the world moves on. David Attenborough's *Blue Planet* and Colin Pillinger's Mars shot excite and enthuse. Then what? Back to the static teaching with no apparent reference to the world in which we all live. Is it any wonder our young people, who wish to carry out research, get turned off?

Evidence and assessment

Innovation feeds on the novelty of ideas and enthusiasm. Both 'blue skies' research and development of product can co-exist and are of equal value. We talk of them, but within a climate of value judgement. Science is a process which bolsters our social and industrial worlds, where evidence is all – well almost all. Political decisions should follow the evidence, not the other way round.

Politicians have yet to learn to ask the questions where evidence is needed, to have the research carried out and to set up a process of assessment involving the public from the very beginning. The public are rightly suspicious of science when it falls into

the wrong hands and often act without even worrying about the science. The feeling is strong that politicians will do what they want to, irrespective of the evidence.

Reform the career structure!

The Chancellor has seen the need for interaction, if not amalgamation, between Research Councils and programmes where they cover the same fields like clinical trials, animal experiments, the effect on social conditions, and so on. Research into issues allowing health improvements are to be unified in one organisation with delivery of both treatment and care in mind. At last we have someone speaking for British Science – the Treasury!

Political decisions should follow the evidence, not the other way round

I await further changes, not just in the organisation of funding bodies but the creation of a truly positive role for scientists and technologists in society. The school science programme is in deep need of reform and it is not just about building new laboratories. Why should justification of a career structure and a well paid job not follow the recent structural reforms in the National Health Service for General Practitioners? Are scientists up for the challenge, or is the safety of the laboratory still a comfort zone?

Reference

1. Budget of 22 March, 2006. See <http://budget2006.treasury.gov.uk/>

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