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Health research

Sir David Cooksey: The Cooksey Review of UK health research funding

Professor Colin Blakemore: The future role of the Medical Research Council

Professor Sally Davies: New structures for health research support

Research paths

Professor Wendy Hall: Future opportunities for UK researchers

Sir Graeme Davies: Supporting research staff – a toolkit for management

Dr John Bothwell: What four things do researchers want?

International development

Sir Gordon Conway: The stark choices for development policy

Dr Vikram Patel: Placing health at the heart of development

Hon Aleke Banda: Building success and development in the 21st century

Intellectual property rights

Sir Hugh Laddie: The cost of litigating IP rights

Climate change

Sir John Maddox: How to keep the world up to date

The Lord Lloyd of Kilgerran Award



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contents



THE COUNCIL OF THE FOUNDATION	inside front cover
UPDATE	
Government departments, health research, climate change, ‘value-added’ scoreboard.	2
HEALTH RESEARCH	
The Cooksey Review of UK health research funding <i>Sir David Cooksey</i>	3
The future role of the Medical Research Council <i>Professor Colin Blakemore</i>	5
New structures for health research support <i>Professor Sally Davies</i>	6
RESEARCH PATHS	
Future opportunities for UK researchers <i>Professor Wendy Hall</i>	8
Supporting research staff – a toolkit for management <i>Sir Graeme Davies</i>	9
What four things do researchers want? <i>Dr John Bothwell</i>	11
INTERNATIONAL DEVELOPMENT	
The stark choices for development policy <i>Sir Gordon Conway</i>	13
Placing health at the heart of development <i>Dr Vikram Patel</i>	14
Building success and development in the 21st century <i>Hon Aleke Banda MP</i>	16
INTELLECTUAL PROPERTY RIGHTS	
The cost of litigating IP rights <i>Sir Hugh Laddie</i>	18
CLIMATE CHANGE	
How to keep the world up to date <i>Sir John Maddox</i>	20
COMMENT	
No, minister. Do as I say! <i>Archimedes</i>	22
THE LORD LLOYD OF KILGERRAN AWARD	23
Understanding the world of speech	
EVENTS	24

UK companies 'outstripping European competition'

The latest Value Added Scoreboard from the Department of Trade and Industry (DTI) shows UK companies are among the most successful in Europe at adding value. Some 210 of the 750 biggest wealth creating firms in Europe are from the UK.

The annual scoreboard uses 'value added' by companies, or the difference between sales and cost of bought-in materials/services, as a measure of businesses' economic contribution. It uses value added per £1 of staff and depreciation costs, or 'wealth creation efficiency', as a key performance measure.

Analysis shows that the most successful and sustained wealth creation results from ongoing investment, particularly in areas like innovation and skills.

One reason for the UK's high performance has been its strength in high-value sectors such as financial services and oil and gas. But strong performances by individual UK companies within these and other sectors have also played a part.

The scoreboard lists the value added, or wealth created, by the top 750 European companies and the top 800 UK companies.

Value added measures continue to provide some predictive power for investors. Shares in 19 high performing companies identified in the 2003 Scoreboard are now worth 166 per cent more on average; the FTSE 350 index has risen by only 89 per cent.

Some 55 per cent of value added is concentrated in the top 100 of the 750 European firms, while 45 per cent is found in six out of 39 sectors (banks, oil and gas producers, automotive, fixed-line telecoms, electricity, and travel and leisure). □

The 2007 Value Added Scoreboard is available at: www.innovation.gov.uk/value_added/default.asp?page=62

Career paths for researchers

The UK Higher Education Sector Working Group, representing a wide range of organisations involved in research provision, including among others Research Councils UK, the funding councils for the UK, the universities, the National Research Staff Association and the Royal Society, has issued a Draft Revised Concordat to Support the Career Management of Researchers (see also this issue, pages 8-12).

The document is designed to build on and develop the original 1996 Concordat.

Responses should be sent to RCUK or UUK by 30 September. □
www.rcuk.ac.uk

Science and innovation move to new department

In a shake-up of Government departmental remits, responsibility for science, innovation, universities and skills has been brought together in a new department headed by Secretary of State John Denham. The new Department for Innovation, Universities and Skills (DIUS) is charged with ensuring that Britain has a highly-skilled workforce, a dynamic business community – which seizes new technology and innovation opportunities – and a world-class science base.

The new department brings together functions from the former Department of Trade & Industry (including specifically the responsibilities for science and innovation) with further and higher education inherited

from the former Department for Education and Skills, and NESTA from DCMS.

The new Secretary of State was a minister in the Home Office until 2003 when he quit the Government over the decision to go to war in Iraq. He is the Member of Parliament for Southampton Itchen.

The new Minister of State for Science and Innovation is Dr Ian Pearson who was until recently minister for climate change in Defra.

The department's Permanent Secretary is Ian Watmore who had previously been at the Cabinet Office where he was head of the Prime Minister's Delivery Unit and the Government's Chief Information Officer. □
www.dius.gov.uk

Cooksey: concern over basic research

The Cooksey Review of UK Health Research Funding (see page 3 of this issue) was the subject of an evidence session of the House of Commons Select Committee on Science and Technology on 24 March. The committee broadly endorsed the review as a "sound basis for the implementation of the single fund for health research". But there were reservations, in particular in relation to the possible consequences for basic research, research outside priority areas and the processes followed by the Medical Research Council (MRC). Committee chairman Phil Willis MP said that the committee wished to see "all funding allocated to health research used for that purpose. This has not always been the case in the past in the case of NHS funding." He added that the committee "will take a close interest in monitoring the implementation and effectiveness of the Cooksey Review recommendations".

In its response to the Cooksey Review, the Royal Society welcomed the key innovation, the "light touch" Office for Strategic Coordination of Health Research

(OSCHR), which is to take an overview of the MRC and NIHR research budgets. However, the response stressed the importance of retaining the MRC's current institutional structures, and the need to protect its international reputation for research excellence.

Speaking in April at a conference organised by the MRC, the National Institute for Health Research (NIHR) and the Association of the British Pharmaceutical Industry (ABPI), the Minister of State for Delivery & Quality at the Department of Health, Lord Hunt, said that substantial progress had been made towards implementing the Cooksey proposals. The OSCHR, under the interim leadership of Professor John Bell, is beginning its work and plans for the Translational Medicine Finding Board are taking shape. □

The Science and Technology Select Committee's report on the Cooksey Review can be found at: www.parliament.uk/parliamentary_committees/scitech150307b.cfm

IPCC releases latest research – in stages

The latest report of the Intergovernmental Panel on Climate Change (IPCC) – the Fourth Assessment Report (AR4) – is being released in stages before the issue of the synthesis report in November. A number of summaries for policymakers have now been issued, the latest being the results of Working Group III on mitigation which was launched on 4 May in Bangkok.

The findings of Working Group II, on impacts, were published at the beginning of April following a night of last-minute negotiations in Brussels over its final wording. In January, the first summary – on the science of climate change – was issued in Paris. The full reports are also now becoming available – the Working Group I report *The Physical Science Basis* has now been put up on the IPCC website.

See also the article on page 22 of this issue.
www.ipcc.ch

Ensuring that medical research feeds through into cost-effective healthcare to NHS patients is a key concern for Government. The dinner/discussion meeting of the Foundation on 17 January 2007 considered the issue in detail.

The Cooksey Review of UK health research funding

David Cooksey



Sir David Cooksey GCB was asked by the Chancellor in March 2006 to undertake a review of health research funding arrangements. He recently retired as Chairman of Advent Venture Partners, which he founded in 1981. He is Chairman of the UK Clinical Research Collaboration Industry Reference Group, Chairman of Diamond Light Source Ltd (the company building the new synchrotron radiation source at Rutherford Appleton Laboratory) and Chairman of London and Continental Railways. In 2005 he retired as Chairman of the Committee of Non-Executive Directors of the Bank of England after 11 years service as a Director.

Our review started from the understanding that we had excellence in basic research in this country, particularly in the medical field. We have a huge asset in the National Health Service (NHS), which could help make basic research, through the development phase, into good therapies for patients. There is no other organisation of its size or capacity in the world, but we have to make it work.

Our review made the assumption that we wanted to invest in research to promote inquiry into the key areas of science, providing a well-trained and relevant workforce both for industry and the research community. We wanted to help make the breakthroughs that would provide low-cost and better healthcare over time. We wanted to support the high level of research investment made into health by the private sector in this country. They are the largest investors in R&D in the UK.

In the applied research arena, there is good reason to invest public money to turn 'bench discoveries' into new therapies, ensuring the safety and efficacy of new products by putting them through the right testing and development processes. We want to optimise the outcomes for patients, ensuring that our healthcare delivery system works under optimum conditions, while keeping healthcare costs under control.

The Chancellor announced the formation of a single fund for health research in his 2006 Budget, when announcing my review. Monies due to be invested in R&D in the NHS had often been diverted into what were considered, by those able to divert them, to be the more important frontline services. The pharmaceutical industry has the capacity to reinforce the knowledge-based economy, but there was a danger of decreased engagement of that industry with the United Kingdom.

The first problem that we encountered in our investigation was amazing for a growth industry based on technology. Productivity had been falling for 15 to 20 years, both the productivity of research in our companies and also the value for money of healthcare delivery. Much of

that arose as a result of inappropriate regulation.

Changes in the culture were needed. We found that the NHS was bad at adopting innovation and new techniques. There were two gaps in the translation process. One was in taking research discoveries through the clinic to the point at which they were approved for use more generally in patients. The second gap in translation was in the actual adoption of those products for use on patients so that the new therapies could be applied. As a country we are slow to adopt new therapies.

The new *Connecting for Health* information technology system in the NHS was seen as a great asset. This is a database of cradle-to-grave records of over 48 million patients, unparalleled elsewhere in the world. It will provide the ability to access people for clinical trials, and particularly for following up on pharmacovigilance.

We also found many perverse incentives. The Research Assessment Exercise, for instance, ensures that applied research is far less valued than basic research.

There were problems with clinical research careers and their funding. The incentives from the NHS encourage becoming a front-line clinician, rather than undertaking research. Consequently, the number of people engaged in clinical research over the last 10 years has dropped by a third. That must be reversed. Also, we are not training the right people to do the right jobs.

There was a perceived lack of engagement with the pharmaceutical industry. The industry has not helped itself by some of the tactics it has adopted in marketing. There needs to be a change in the culture. If we are to make this the best place in the world to undertake the development of new drugs, devices and therapies, then we must have a research continuum, going from early stage bench research through to providing both benefit for patients and for the economy. For this we need a successful life sciences industry.

Having identified these problems, we examined the alternatives and looked at whether there should be one or two bodies to carry out the R&D functions of

Concerns on funding mechanisms. In the discussions, doubts were raised about whether the ring fencing of funds for research would be effective, and there were concerns whether the emphasis on applied research would mean a cut-back on basic science. If political priorities changed or if there was a funding crisis in the NHS, many feared that research funds might be diverted to the day-to-day running of the health service. It was noted that while the Government had accepted a House of Lords recommendation that 1.5 per cent of NHS funds should go on R&D, the present figure was only 0.75 per cent.

the Medical Research Council and NHS, and whether one (or both) should report through the Department of Health or the Office of Science and Innovation (OSI). We concluded that the OSI was not right: it would be impossible for an organisation the size (and with the responsibilities) of the NHS not to have a research organisation, but on the other hand the Department of Health was certainly not ready at this time to accept the existing role of the MRC.

Recent successful developments have involved interdisciplinary research. We did not want to put the MRC into a position where it no longer had intimate contact with the other research councils. We decided on having a single funding source, to be managed by an office that we call the Office of Strategic Coordination of Health Research (OSCHR). We had to ensure that this body would have the power to bid for the right amount of money from the Government, be able to distribute it in a way that addressed all of the issues that I have described, could change the culture of both the Health Service and the MRC and indeed coordinate all this.

Our proposals aim to ensure that the money intended for health research remains intact and is not raided. That requires that the National Institute of Health Research (NIHR) should move from being a virtual to a real agency over the next three years, and it is here that the monies for NHS research will reside.

The OSCHR would be responsible for the comprehensive spending review bids, following the publication of its strategy for health research in this country. That would also be informed by a degree of prioritisation by OSCHR, where it would point to the areas where we have the greatest unmet clinical need, qualified by where we had the skills to be able to best respond to those needs, and it would ensure that the research community understood where the most urgent needs were.

Once OSCHR had bid in the Comprehensive Spending Review and had its monies allocated, it would ensure they were apportioned through the Department of Health and the NHS, and

through OSI for the MRC, so that the current reporting structures remained intact. OSCHR would not undertake performance management for those monies, but would report annually about the progress that was being made.

We proposed a new Translational Medicine Funding Board, to provide funding for all translation work – basic and applied clinical research – in order to get the greatest possible benefit from that work. All this is aimed at achieving better healthcare for patients, more affordable healthcare delivery and bringing down the cost of drug development.

As interim Chair of OSCHR, John Bell combines an understanding of both the research community and its interface with the industrial world, as well as the NHS and all its ramifications, in a way which should make a huge difference to the credibility of the organisation.

Liam O'Toole is Chief Executive of OSCHR. He successfully headed the UK Clinical Research Collaboration. OSCHR will be a small organisation with a light touch and he will add to the ability of that very small team.

There will be a single spending review bid for the whole of health research, to achieve the funding for the MRC and the NHS R&D function. As a result, it will be able to assemble a more widespread and coherent programme.

The Translational Medical Funding Board is an attempt to make a difference in this pull-through process of the research continuum and to make the outcomes more attractive to industry. We must keep the pharmaceutical and biosciences industries in this country, and we can only do that if we make the interface between health research and product development, and those companies, seamless and attractive to them. The *Connecting for Health* process must be successfully delivered since they perceive that it will truly differentiate Britain as a place to develop new therapies.

The next, and final, area is the new drug development pathway that we propose in the report. Much of the fall in productivity has been due to the ever-extending time it takes to get drugs

approved and also to the increasing levels of safety and efficacy monitoring required in that process. During the review process, we have worked with the National Institute for Health and Clinical Excellence (NICE) and the Medicines and Healthcare products Regulatory Agency (MHRA). We have visited the Food and Drug Administration (FDA) and the National Institutes of Health (NIH) in the United States and it is clear that we could take a different attitude, provided we have the data, which can be provided by Connecting for Health.

We can use the prioritisation of unmet health needs to target potential drugs going through the approval process. The UK Clinical Research Collaboration (CRC) is working to improve the methodology for approval of the Ethics and R&D Committees and for a more transparent pricing of trials in order to accelerate that process, but Connecting for Health must rapidly identify and recruit the right candidates for trials, and be used to monitor them afterwards.

We propose that NICE should be involved earlier in the process which is welcome to some, but not all, pharmaceutical companies: that is an area of debate. They would be involved in the design of Phase 3 trials so that the industry would understand what information is needed to win approval.

We examined the possibility of giving conditional approval for drugs for nominated cohorts of patients, who would be identified through the Connecting for Health system and would enable us (instead of having a single gate at the end of Phase 3 of either registration or non-registration of a drug) to launch the drug to increasing numbers of patients through this choice of cohorts. The advantage is the ability to monitor this in real-time for surveillance purposes. Eventually you would have data about far more patients, while the initial pricing at the time of the conditional approval would be much the same as under the Pharmaceutical Price Regulation Scheme at the moment. Pricing would be reconfirmed or adjusted, according to efficacy, at the end of Phase 4 – at which time the drug would be generally released.

To conclude, the Cooksey Review aimed to ensure more collaboration through the research continuum – between basic scientists, between the applied and clinical scientists and into industry. That will only be achieved through culture change. I found it encouraging that, on the day that the report was published, the Department of Health, OSI and the Treasury all agreed with all of its recommendations. □

www.hm-treasury.gov.uk/independent_reviews/cooksey_review/cookseyreview_index.cfm

The future role of the Medical Research Council

Colin Blakemore



Professor Colin Blakemore FRS FMedSci Hon FRCP, is Chief Executive of the Medical Research Council and Waynflete Professor of Physiology at the University of Oxford. He studied Medical Sciences at Cambridge and completed a PhD at the University of California, Berkeley. After eleven years at Cambridge, he moved to Oxford in 1979. He was Director of the MRC Centre for Cognitive Neuroscience for eight years.

The MRC has a worldwide reputation for funding basic research that has revolutionised the biosciences and underpinned the biotechnology industry. But less well known are its equally impressive contributions to clinical research, which have had huge impact on clinical practice and the quality of life. These range from pioneering research on vitamins and infectious disease, to the development of randomised, controlled clinical trials (the gold standard for healthcare intervention assessment), discovery of the link between smoking and disease and, more recently, working with the Biotechnology and Biological Sciences Research Council (BBSRC) to put this country at the forefront of stem cell research.

In 2003, the MRC made a strategic commitment to strengthening clinical and translational research – a commitment that proved to be timely. We sought advice from the Clinical Research Advisory Group (CRAG) and conducted a strategic review of activity across the whole of the biomedical spectrum, from the most fundamental research to clinical and public health research, clinical trials, and research on implementation and delivery.

CRAG helped us to define translation (a question that exercises medical research funders around the world). We see translation as the flow of knowledge across the entire biomedical research spectrum, aimed at facilitating health benefits. Translation is more an attitude of mind than an isolated field of research. CRAG defined it explicitly as “the bi-directional transfer of knowledge between basic research in the laboratory with that in the whole patient”.

Since 2003, our spending on basic science has increased significantly. We have built on our programmes in regenerative medicine, integrative physiology and brain sciences. Work on mutagenesis has advanced our understanding of the genetic basis of normal function and disease. The planned new building for the Laboratory of Molecular Biology in Cambridge is an important signal of our continuing emphasis on basic research.

We have doubled our commitment to clinical trials and are still the largest public funder of: Phase 3 clinical trials and intervention trials, especially hypothesis-testing trials; trials in the developing world; and trials aimed at improving trial methodology.

We have doubled our spending on clinical fellowships, are developing the General Practice Research Framework and are investing in centres for public health research. We responded rapidly to the pandemic influenza threat, committing an additional £13.5 million.

Experimental medicine – investigative studies in humans, exploring the basis of normal function and disease processes and testing new approaches to diagnosis, treatment and prevention – is widely recognised as an opportunity area for the UK. We joined partners in the UK Clinical Research Collaboration (UKCRC), investing about £130 million to expand work in experimental medicine, including the establishment of new clinical research facilities and a call for research proposals from the MRC, which generated nearly a thousand expressions of interest with a total demand of £330 million! We committed £15 million last year but further calls are planned. We have also launched a programme of work on the validation of biomarkers.

Within our population sciences programme, particularly noteworthy is the launch of *UK Biobank* (co-funded with the Wellcome Trust and the Department of Health). This is the world’s largest comprehensive cohort study with around half a million volunteers, studying genetic and environmental influences on health and disease in middle and older age. Our research units devoted to topics relevant to population sciences have formed a network to explore new methodological approaches to population studies.

Some five per cent of our budget is devoted to global health issues and we have two substantial research units in Africa. Epidemiology and clinical trials form a large part of our effort in that area. Our Uganda unit can claim a part in transforming the HIV infection rate there from among the highest in sub-Saharan Africa to the lowest.

We have established 21 research centres in UK universities, including six this year dedicated to translational medicine. And we are planning to move our biggest basic research institute (the National Institute of Medical Research) into partnership with University College (and perhaps other organisations), specifically committing it to extending its translational work.

Our technology transfer company MRC Technology has an excellent record in devel-

oping and exploiting intellectual property from MRC units and institutes. Its income last year was about £65 million – more than that of all UK universities. We are now launching a number of other schemes to encourage MRC-supported scientists to collaborate with industry.

All this has been helped by the Government's generous increase in science funding over the past few years but, compared with the MRC, the US National Institutes of Health spend seven-and-a-half times as much per head of the population and Singapore about eight times more. The MRC cannot fund all the world-class applications that it receives and desperately needs a significant increase in its budget if it is to respond to the exciting opportunities to build the science base and stimulate innovation. We are, then, enthusiastic about the opportunities that have emerged as a result of the Cooksey review.

The Cooksey proposal most relevant to the MRC is that OSCHR will shape the overall funding for the two arms of the structure and ensure that the strategies of the two are well aligned. There could be real improvements in the efficiency and the value for money of health research. Cooksey assigned responsibility for applied research to NIHR, which will involve some small shift of responsibility from MRC. We must develop close and flexible working with NIHR: defining responsibilities more clearly must not generate new barriers to the flow of information and the translational process.

The new Translational Medicine Board (jointly owned by MRC and NIHR) will help us to develop new partnerships, particularly with industry and other funders. And it will help us to find new ways of speeding translation.

Cooksey gives the MRC the task of sustaining the quality and volume of the

UK's biomedical research base. 'Basic science' does not mean only pre-clinical science: the MRC currently spends about one third of its money on basic *clinical* science, much of which is not done in a hospital setting. We must also grow our support for training and infrastructure, to meet the increased demands. It is crucial that support for all this underpinning science grows to feed the new opportunities for translation. Although definitions of translation vary, it is certain that you cannot carry out good translational research without a good research base on which to build.

We are pleased that the MRC remains part of RCUK because the progress of medical science will, as in the past, depend on opportunities to engage with other areas of science – the physical sciences, engineering, social and behavioural sciences, computation and mathematics.

As we move to implement the Cooksey agenda, we must be vigilant to ensure that important areas of research are not neglected or lost. In particular, we must sustain the UK's contribution to global health issues and to international collaboration.

A key question to ask is what sort of health research system do we need to compete in a changing international field? Our current main 'competitors' might be the United States, Canada and Germany. But in the future they will certainly include China, South Korea, Singapore and India. The competitiveness of UK health research will depend on the quality of our universities and medical schools and there we have a good start. A recent *Times Higher Education Supplement* survey put two of our universities among the top five in the world in biomedical sciences.

We have some unique health research infrastructures, including *UK Biobank* and many other cohorts, the Wellcome Trust's Sanger Centre with its incomparable

facilities for genomics, MRC's units and institutes, and the advantages for clinical research offered by the NHS. When it is fully functional, *Connecting for Health* (the new IT system for England) should be a hugely powerful tool for research and for monitoring treatment safety and effectiveness.

The challenges for the future include:

- strengthening translational research, and keeping a broad view of translation that encompasses diagnostics, devices and public health, as well as the development of new drugs;
- encouraging public/private alignment that balances the interests of public and private sectors;
- developing new mechanisms for decision-making and evaluation, in addition to the well-proven methods for the support of basic research;
- providing long-term support and freedom to operate for exceptional scientists, while developing strategy on the basis of intelligent analysis of need and opportunity to improve health.

The Cooksey report emphasises the establishment of strategic priorities on the basis of the analysis of unmet clinical need and the magnitude of potential benefit. The MRC welcomes the opportunity to incorporate such knowledge in its strategic planning. The difficult task will be to marry the assessment of need with an appreciation of scientific opportunity and the tractability of scientific problems. Nixon's 'War on Cancer' proved that sensible choices about the support of research depend on more than the definition of need.

The new Cooksey mechanisms will be reviewed in 2011, but we must already be thinking about how we should judge success and performance and whether we can do things even better in the future. The MRC welcomes these opportunities. □

New structures for health research support

Sally Davies



Professor Sally Davies FMedSci is Director General, Research and Development at the Department of Health and the NHS. She developed the new Government research strategy, *Best Research for Best Health* with a budget of £776 million and is responsible for its implementation.

I think it is very good for the nation that the Government accepted the Cooksey Review. My job, along with that of Sir Keith O'Nions, is to deliver it. It can be argued – as Sir David Cooksey has – that we are not currently spending enough on applied and clinical research. However, I have also been supporting – and will continue to support – the role of basic research: I speak for it, this is one of my roles in the Department for Health.

We have a model (albeit a horribly complex one) for the new structures post-Cooksey, but we believe it can

work. It includes the National Institute of Health Research (which was launched on the 1 April and is the new way of doing business with the Department of Health's NHS money) and the MRC. The Secretaries of State are playing a key role in ensuring that funding will come from the Treasury to both Departments and into OSCHR, out again and down to the other bodies. This will have interesting ramifications as OSCHR decides the allocation balance.

We also welcomed the chapter concerning NHS incentives and culture. The

Single source or a plurality?

While the arguments in favour of a single funding stream were strong, there were considerable advantages in having a plurality of funding sources: competition would mean greater effort in deciding between various options. There were also concerns that the creation of an Office for Strategic Coordination of Health Research (OSCHR) would create an elaborate management structure: there appeared to be overlapping jurisdictions, numerous committees and subcommittees, and no single accounting officer to answer for proper allocation and spending controls. In its defence it was suggested that, in practice, it was less complex than it appeared. OSCHR would be a very small body, and existing cooperative arrangements between MRC and NIHR worked well.

discussion

We are developing our internationally recognised Health Technology Assessment programme. We currently have 81 trials actively funded, with a core of commissioned trials to answer the questions that NICE or the Service raises. We also have a new clinical trials programme in response mode. We will fund wherever we can get the work we need and the people we need to do it.

As we increase the transparency of all our funds, that £550 million that was sunk in trusts is now being taken out and reinvested. The budget is ring-fenced. Next year my budget is £776 million. People are key to delivering research. Research is almost invariably, but not always, led by academics of many professions. Clinical and applied research is generally led by doctors, but of course health economists and social scientists are key, while the NHS plays a crucial role in putting patients into these studies and collaborating. We have to safeguard the salaries that have been paid for, in the past, by the NHS. We worked with a faculty implementation group advising us, and took proposals to our National Institute for Health Research (NIHR) advisory board who supported our work plans for the future.

We are working through a system (that will be very similar to University QR) in order that hospitals and their associated academic partners enjoy some stability. Based on the amount of money they receive from us through programmes and infrastructure, there will be an amount (calculated by formula) that can be spent on people – to give as grants, bring in new people or develop people. This will be significant funding – about 70 per cent of the work that we fund, from our budget of £776 million, is spent on salaries.

The Department for Health is delighted that applied health research and clinical research are now at the centre of the agenda for the Government as well as for charities and industry. We will work with all our partners and colleagues and we believe the NIHR will be very good for delivering what is needed for this nation.

It will be hard work. We have to climb a mountain alongside the MRC with OSCHR in the next two and half years. I think we can do it. We want this to work, the MRC have said they want this to work, OSCHR has been put in place to make it work. □

money that is spent by the Department and parts of the NHS on research, academic fellows and trainees will be protected. In addition, as a result of Sir David's report, we have agreement to collect the extra money being spent by the NHS on research by clinical academics and protect it for clinical and applied research: that is potentially a significant resource, particularly in a couple of medical schools (Cambridge and Leicester) where the Primary Care Trusts (PCTs) hold that money. This enables us to ensure that the latent programmes that are so important to our future will be going forward.

The system I inherited saw £550 million going to hospital trusts to fund research. Historically, 68 per cent of this took place in London: one hospital last year got over £60 million. Our modelling suggested that the money might not have been in the right place. We were unable to account to our ministers and Parliament for how this money was spent, on its relevance or its quality: it was not transparent. So the Treasury had charged our department with making this into a transparent system, and I needed to develop that.

We started work on developing a new strategy: consulting, holding stakeholder conferences, and eventually going out for public consultation. It was an important consultation, we listened and I think we achieved a dramatically better strategy at the end. Having developed the strategy, *Best Research for Best Health*, it was launched on 25 January 2006; and we took it through a Cabinet mechanism to make it a Government strategy. So for the first time we actually had an R&D strategy that was 'signed off'.

As any strategy ought to be, it is about people. Every part is simple, the complexity comes in implementing it and recognising that different aims have to be addressed through different solutions. We set up a website where everything could be found. We are managing everything via project management and implementa-

tion plans. All this is available on the web, with timetables so that everyone can see what we are doing.

One target is to double the number of patients going into clinical trials: we now have over 12 per cent of cancer patients going into public sector clinical trials, more than any other country. We have set up five further topic-specific networks across the country, led by leading researchers in these fields. From April 2007 we will start to put in place the network that will cover the whole country and support research in all these clinical areas. We work not only with the public sector but with industry to develop effective networks.

The Experimental Medicine Centres competition was led by the Wellcome Trust, where they, us and others put up the capital costs. We are putting in about £20 million per year of running costs. In the cancer network, Cancer Research UK leads our partnership.

Turning to the biomedical research centres, we undertook to support the best in their efforts to become even better. We are giving £100 million per year to this, specifically to the Cambridge, Guy's-King's, Oxford, Imperial-Hammersmith and University College Partnerships and some specialist areas – paediatrics at Great Ormond Street, eyes at Moorfields, cancer at the Marsden, mental health at the Maudsley, gerontology in Newcastle and infection in Liverpool. We have also funded two international centres at Kings College and St Mary's (at over £3 million) focussing on patient safety and quality.

The role of the trusts.

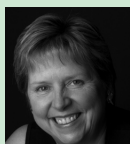
How would individual NHS trusts — particularly Foundation Trusts — view the new arrangements? Their own governance powers might lead them to wish to allocate funds differently. Although the policy was to keep NHS R&D funds within the control of the Department, the evolution of the NHS under Commissions, as suggested by both Gordon Brown and David Cameron, might make this difficult.

discussion

Can the career path for young researchers in the UK be improved? This issue was debated at a dinner/discussion of the Foundation on 7 February 2007.

Future opportunities for UK researchers

Wendy Hall



Professor Wendy Hall CBE FREng is Head of the School of Electronics and Computer Science at the University of Southampton and a founding head of its Intelligence, Agents, Multimedia Group. She is Senior Vice-President of the Royal Academy of Engineering and a member of the Council for Science and Technology. Professor Hall has published over 300 papers in areas such as hypermedia, multimedia, digital libraries, web and knowledge technologies. Photograph: Robert Taylor, Robert Taylor Photography.

I am a member of the Council for Science and Technology (CST), which reports directly to the Prime Minister and to the first ministers of Scotland and Wales. The CST is currently co-chaired by Sir David King, the Chief Scientific Adviser, and Sir Keith Peters¹, Emeritus Regius Professor of Physics at the University of Cambridge and Interim Director of the National Institute for Medical Research. We work with the Government on many strategic science and technology issues and produce reports on a number of subjects, either at their behest or on our own initiative. A recent example is *Health Impacts – A Strategy Across Government*, in which we set out our recommendations for ensuring that all Government departments take health issues into account when developing and delivering policies (which is more easily said than done).

The CST is unique among UK organisations in its ability to take a 20- to 30-year view of the impacts of current policy on academic researchers. In that sense, we can take a leading role in addressing long-term issues in a way that is not possible for individual agencies or Government departments. It is clear that we need to nurture researchers at the start of their careers – in order to maintain the excellence of our science base and the competitive edge of our economy in global markets. We were very pleased to note the work being done by the Royal Society, which dovetails with ours, aimed at ensuring that the provision of higher education in science, technology and mathematics in the UK remains fit for purpose.

As part of our work in this field, we set up a research endeavour subgroup. We chose the word ‘endeavour’ with its wider connotations in preference to ‘strategy’, in order to reflect the broad remit of the subgroup. Its aim is to review the entire system of research funding in the UK – who we fund, what we fund, and why we fund it – to determine which aspects of the system will need to be modified in order to maintain our excellence in research. We began by forming a focus group, consisting of young PhD students and postdoctoral researchers, to talk about some of the challenges facing both the

UK as a whole and individuals engaged in research in particular.

One of the first issues to emerge from their discussions was the need to increase the attractiveness of academia as a career option for the very best students. At present, many of them fall into an academic career by default rather than as a positive choice. We also have to recognise that only a minority of postdoctoral researchers will secure permanent positions within academia. So we should not regard career options outside the UK, either in industry or in universities abroad, as a last resort taken only by the less successful. It has to be said, though, that this view often does prevail, unfortunately, particularly since the role models for postdoctoral researchers are themselves UK academics.

It is also very clear that we must look beyond this island and take a global perspective, which may mean changing the way we do things. The big new challenges – climate change, energy, health issues – cannot be addressed by narrowly focused teams working in a single institution. These issues will require much broader multidisciplinary and interdisciplinary approaches on an international basis. Researchers will need to be portable. People are already beginning to talk of one country’s money being spent in another: this is a notable departure from the norm and will exacerbate the difficulty that research-funding bodies have in assessing the return on their investments.

There is an urgent need for a national framework to support research careers – and I use that last word carefully – that has the backing of funders, employers, higher education institutions and researchers. It needs to be designed to provide a flexible and non-prescriptive guide to possible career paths for researchers (of whom there are many), beginning at the level of PhD and encompassing work both within and outside academia. Such a framework would provide guidance on each stage of the possible career pathways, including information on career options, opportunities for training and development, levels of responsibility, possibilities for placements

Pro-academic bias. The role of Principal Investigators (PIs) in guiding the careers of their young researchers was the subject of much debate. PIs do not necessarily have a knowledge of industry and the opportunities there for careers in research. There is also a cultural bias in which any option other than an academic post is considered second-best, and the researcher who follows a non-academic career is seen as a failure. Indeed, the term 'exit strategy' carries the connotation that the researcher is being thrown out of Eden to seek his or her bread in the outer darkness.

discussion

and internships in other sectors or disciplines, and exit strategies for those leaving academia.

Specific changes we believe could make a real difference to young researchers include greater independence and more responsibility much earlier in their research careers. These changes will not be achieved, however, without specific training for supervisors, line managers and principal investigators (PIs), as well as the researchers themselves. Additional responsibility for researchers might take the form of a supervisory role in the laboratory, or acting as a PI and applying for a wider range of grants than is usual for postdoctoral research staff at present.

I am a member of the scientific council of the European Research Council

(ERC), which has decided to fund the best research through fellowships. Our first call for applications will be for what we term 'starting grants': these are for early postdoctoral researchers and aim to give them independence. The successful candidates will be able to take these grants anywhere in Europe, and we will be encouraging people from outside Europe to apply as well. Our hope is that there will be competition from institutions for people with ERC fellowships. We think there are ways of encouraging higher education institutions to fund their own fellowships as well, possibly through strategic partnerships with research councils or industry. We also want to support researchers who want to move between disciplines. Transitional

grants are available, but we would like to see these extended to widen the opportunities researchers have to learn from other fields at early stages of their careers.

Although the skills postdoctoral researchers have are valuable outside academia, they are often not recognised as such, either by the researchers themselves or by potential employers. So we would also like to see greater use of placements and internships to facilitate a two-way flow between academia and industry.

We need to give researchers a stronger presence, and a voice that is heard. The standards of supervision and management they receive can be appalling and many are frightened to speak up. The overriding issue is the attitude of universities toward their research staff, whom they often regard as the 'property' of PIs. This attitude is largely responsible for keeping researchers tied to short-term grants. We must learn to let our fledgling researchers go, allowing them to develop so that they can go out into the world and conduct their own research, be it in academia or in industry. In short, researchers need career development, greater job security and, above all, **recognition. It is time for radical change.** □

1. Sir Keith Peters stepped down as CST co-chair in February 2007, but remains a member of the Council. Professor Janet Finch, Vice-Chancellor of Keele University, has taken over as the independent co-chair.

Supporting research staff: a toolkit for management

Graeme Davies



Sir Graeme Davies FRSE FREng is Vice-Chancellor of the University of London. After academic posts in Auckland and Cambridge, he became Professor of Metallurgy at the University of Sheffield in 1978. From 1986–1991 he was Vice-Chancellor of the University of Liverpool. From 1992 he was Chief Executive successively of the Universities Funding Council, the Polytechnics & Colleges Funding Council and HEFCE. He was Principal and Vice-chancellor of the University of Glasgow between 1995 and 2003.

How can we develop a better career path for young researchers? The critically important point is to ensure that, in order to deliver things like the science and innovation agenda for the Government, we have enough of the right people, and we keep these 'right' people. That is, we recruit them, we motivate them and we retain them.

The higher education sector has been concerned about this for a very long time. It really started when the Association of University Teachers concentrated their fire in the late 1980s on heads of institutions and heads of department about the position of contract researchers. While progress has been made since then, there are still shortfalls.

When one thinks about career progression, the vision that comes to mind is a lifelong process of making choices. However, a career is not a series of separate little packets. Although there is certainly an element of serendipity involved

from time to time, there should be some thought in the minds both of those responsible for young researchers and of the young researchers themselves about the direction in which they are going.

It is worth noting the legal position of postdoctoral researchers. Many of us remember the sequential postdoctoral research posts of the 1970s. The universities often tried to control this by decreeing a maximum of three sequential postdoctoral posts for any individual. However, researchers often found a way around this rule and were, in a sense, cannon fodder. Employment law has, however, changed since then. Under the current legislation regulating temporary employment, redundancy pay and other employment rights of full-time employees are accrued after two years of temporary employment. In view of this, one must ask why heads of higher education institutions are so reluctant to offer open-ended contracts.

It would make such a difference. Let

PIs as managers of staff. Higher education institutions often fail to give PIs the support and training that would enable them to be successful managers and appraisers of their staff. Grant-giving bodies should require evidence of good management of research staff as a condition of their grants. PIs should not be allowed to use the excuse that they are too pre-occupied with other matters to manage their research staff professionally; a senior post in any field or sector carries both management and professional responsibilities, and academia should be no exception.

discussion

me give you one example: if an individual has a fixed contract, he or she is unlikely to be able to take out a mortgage. However, if that same person were to have an open-ended contract, he or she would be eligible for a mortgage since, as far as the mortgage provider is concerned, there is a likelihood of continuing income. This is the kind of practical help we should be giving our researchers, so that they can do the sort of things that most of us want to do, such as buying a home and starting a family.

We have seen some constructive changes since the 1980s in increased common ground between the funding councils, the research councils and the universities. Although this is somewhat reassuring, it is no substitute for doing things properly. Nevertheless, these bodies have worked hard to generate protocols that secure improved career prospects for contract researchers. There have been a number of reports on this issue, but I will concentrate on those from three bodies: Universities UK, Research Councils UK, and the Higher Education Funding Council for England (HEFCE).

Their reports are, in the main, quite mature documents. The first of them, the *Concordat* of Universities UK, was published in 1999. Its core proposition is that contract research staff should “benefit from the experience and test out their suitability for further research”. The *Concordat* also emphasises that, while many of the individuals concerned have the potential to become long-term researchers, disappointingly few will gain permanent posts as teaching staff in universities or colleges. We are thus losing the very people we need to retain if we are to meet the goals of the science and innovation agenda.

The *Concordat* has much to say about finding and applying effective policies for ensuring that standards of recruitment and career management are followed, performance management is well structured and in-service training is provided. This last includes setting out the alternatives available for individuals who may not be able to continue working in academia.

More recently, Research Councils UK

published two reports. The first, *Research Careers and Diversity Strategy*, lays down the responsibilities of those in receipt of their funding. It defines very clearly the intention of its strategy, which consists of three overarching aims: to attract people to research careers; improve the quality of research training; and retain the best researchers. Other aims include producing or promoting diversity within the workforce and enhancing the UK as a destination for the best researchers.

The second report, *Strategy for Success*, also emphasises diversity. For example, one of the declared aims is that all postdoctoral researchers should have the opportunity to spend some time working in an environment outside their immediate laboratory, whether this is in industry through a short exchange, or elsewhere – perhaps even in the media, on attachments where they will learn about the promotion of science in the public domain. In this way they will slowly build up a portfolio of expertise and thus expand their career options.

Third, and to my mind the most intriguing, is the report entitled *Management of Contract Research Staff* published by HEFCE. The study that led to the report was headed by the University of Sheffield and involved 17 other universities. It also had very strong input from what was then the Office of Science and Technology. The aim it set out was to research, promote and, importantly, embed “improved personnel management of the 26,000 plus contract research staff employed within HEFCE-funded institutions” – a simple but very important goal. It was taken forward in four key areas: continuing professional development; staff review and development; career tracking; and diversity of employment skills.

HEFCE took the aspirations embodied in the *Concordat* and of the two reports from Research Councils UK to create a toolkit for those responsible for contract researchers. It ran for two years and was very successful. At the end of the day, it provided a very clearly defined framework based on the timeframe of a typical research contract, setting out what should

be done in the first three months, during the core research period (perhaps the next 27 months), a time four to six months before the contract ends, and again at the end of the contract.

The toolkit covered both the induction process and regular staff reviews, including documentation on how to conduct staff review meetings. Thus, everything was provided; no one had to reinvent it. In my judgement, every principal investigator (PI) should have the website containing this toolkit bookmarked (<http://gmpcrs.group.shef.ac.uk>). As an aid to research, it is no less important than an electron microscope, since happy contract researchers are good contract researchers.

Returning to the question of how we can develop a better career path for researchers, I believe we already have the answers. The questions now are: Where has it all gone wrong? Why is a framework not embedded? What has happened? My belief is that it has not always been taken on board by PIs. We all know that there are conflicting interests (and many of us have not always been as good as we should have been as PIs). If I, as a PI, give useful information on career alternatives to my very best researcher, he or she may leave; therefore, I had better keep this person in the dark. In other words, there are touches of that ubiquitous behaviour in higher education known as ‘enlightened self-interest’ that are nestled very firmly in the brains of PIs. We need to find a way of overcoming this problem.

One method might be the use of incentives, either positive or negative. One thing I have learned in my years in higher education is that people respond to incentives. Many will remember the introduction of grants tied to completion rates, where institutions were told that if their completion rates were insufficient, they would not be able to apply for further grants. What happened? Institutions began to change their attitudes toward people completing their PhDs.

It has been suggested that 5 per cent of the value of every research should be set aside as ‘soft’ money. This would be paid only if, at the end of the grant, the institution can convince the sponsor that it has genuinely taken steps to give its contract researchers the prospect of a better career, including regular discussions. My feeling is that this would change behaviour almost immediately.

This is the sort of thing we need to do. We have to take what is already a well-equipped and well-defined landscape and make it a practical reality. Those responsible for taking forward contract research in the interest of higher education must take this framework seriously, implementing it properly and with commitment. □

What four things do researchers want?

John Bothwell



Dr John Bothwell is a postdoctoral researcher based at the Marine Biological Association in Plymouth, where he studies seaweed development and teaches microscopy to postgraduate researchers. In 2005 he helped to set up the National Research Staff Association (NRSA) of the UK, partly as a result of his own experience of the limited support available to UK postdoctoral researchers. Aiming to unite the local research staff associations that are springing up around the UK, the NRSA is currently applying for funding and consolidating the lobbying work of its first eight months.

I am speaking as an average representative of the 36,000 academic research staff in the UK. Around 30,000 of us have full-time jobs, with the remaining 6,000 working part-time. The UK research workforce numbers about 110,000, so we make up about one-third of the total. Of that number, around 30 per cent of us are involved in bioscience, like me (again, I am very average). Roughly 15 per cent are in the physical sciences, about 10 per cent are in clinical medicine, about 10 per cent are in maths and about 10 per cent are in the social sciences.

My career path has also been fairly typical. I started in 2000, gaining my PhD working on rat brain volume regulation. I decided to move to plants, specifically the electrophysiology of *Arabidopsis thaliana*, which will sound more familiar if you are biological. Following that, for various personal reasons, I moved to Plymouth and played professional rugby for a year. This may be a slightly unusual choice for an academic researcher, but it is not at all unusual for a research staff member to take a year out at some stage, particularly if they are female or starting a family. Many researchers also take a year out to work in industry, or to travel. I remained in Plymouth and moved to a post working on seaweed development which is split between Plymouth and Lancaster.

Each of my postdoctoral positions lasted for three years, so I have been employed for six years now. My contract has, in fact, just finished so I am currently unemployed. I have published 10 papers, which have been cited around 210 times. It may seem like a lot to some of you, it may not sound like very much to some of you, but it is about average in my field. As a result of all this moving geographically and moving between fields, where do I find myself on the UK research ladder?

A brief overview might help to put my career into context. Most undergraduates who gain scientific degrees will leave academia. A small proportion will go on to become postgraduates, doing MSc or PhD degrees. The bulk of these will also leave academia. Once we leave postgraduate education, we start to pay taxes and move away from being students, becoming professional scientists at the postdoctoral or research staff stage. I should emphasise that many researchers will not go on to do doctoral degrees; they will do higher degrees such as the MSc.

The minority who stay in academia can all too easily find themselves locked in an endless cycle of sequential postdoctoral

contracts. Of these, a small number will break out to become independent fellows and secure their own funding. Their most likely career path is no longer out of academia; it is to become a lecturer. It is possible, although uncommon, for an individual to jump straight from a postdoctoral or research staff post to a lectureship. Lecturers then tend to become readers and readers tend to become professors.

Research staff, however, fall between two stools: they are professionals but they are not permanent staff and they tend not to become permanent. An estimated 70 per cent of research staff aspire to become professional academics at the start of their careers. However, after a few years experience this number drops to under 50 per cent.

Let me explain why. There is a website called 'www.jobs.ac.uk' on which academic jobs are advertised. During one week in February, there were 109 research staff positions advertised, five professorships, two independent fellowships and 17 lectureships – and I should add that 17 is unusually high; there are normally around 10 such positions.

These figures are bad enough, but the diversity of titles for the research staff posts compound the problem. All 17 lectureships were advertised as such, all five chairs were advertised as being chairs and both fellowships were advertised as fellowships. The 109 research staff positions were advertised variously as being: research staff, postdoctoral research associates, postdoctoral research assistants, postdoctoral fellows, senior research scientists, a couple of other permutations of postdoctoral research associate and assistant and fellow, and, my particular favourite, postdoctoral training fellow.

This attention to nomenclature may seem trivial but it reflects the fairly amorphous nature of research staff in academic institutions. People are unsure what to call us because they do not know what we do or what they want from us. In the past year, I have given six professional academic talks at institutes or conferences, four talks to schools and the general public (mainly because my wife is a teacher) and have taught for two weeks at postgraduate workshops. I have also published three papers and four articles in the general press about postdoctoral researchers, proofread another person's PhD thesis and reviewed two manuscripts for journalists. I have had seven fellowship or job applications turned down. I have become a father. This is the eighth meeting I have attended on the topic of

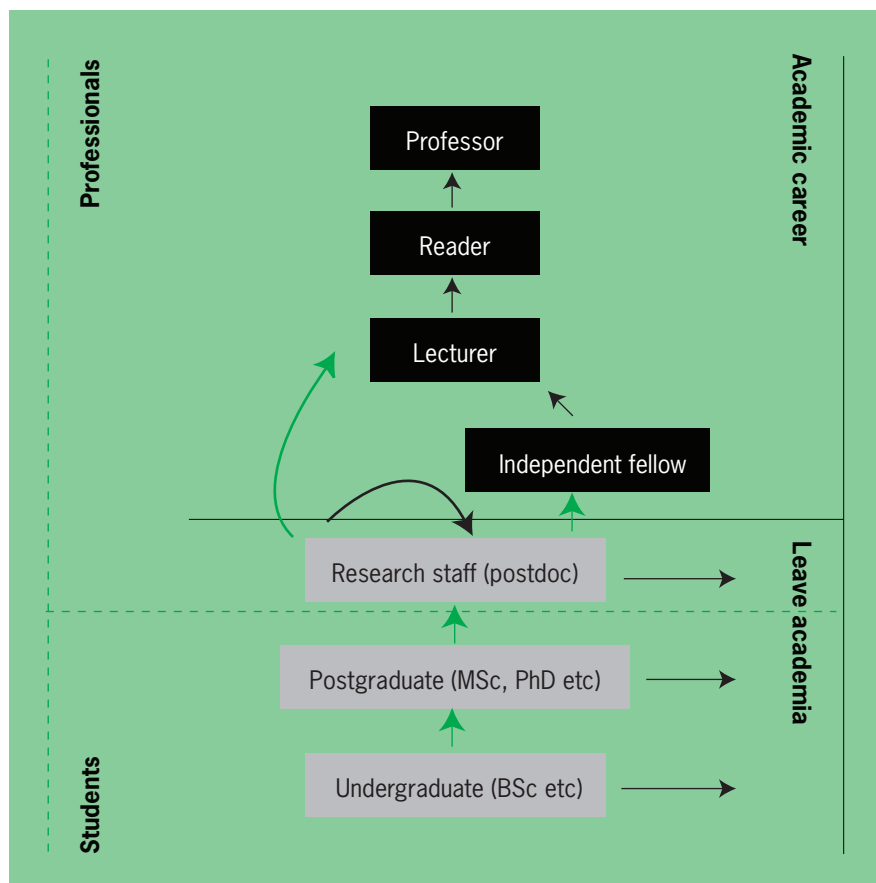


Figure 1. Career paths for those entering higher education.

research staff. Of all these activities, there is none – apart from fatherhood – that I did not do, or have the chance to do, during my doctoral studies. This is one of the key problems with research staff careers: what skills should we be developing to make us ‘post’-doctoral?

So, what do research staff want from their careers? We want four things – information, opportunity, responsibility and recognition.

First, we would like information. We would like to know exactly what it is that we are being rewarded for and what people want from us. Put simply, there are three key parties we need to keep happy: our principal investigator (PI) who is our immediate boss; our higher education institute; and our funding body. Our PI tends to want us to do research, provide a modicum of laboratory management, and possibly do some teaching. Our higher education institution has a slightly different remit; it wants some outreach activities done – teaching and giving talks in schools. It may want us to teach postgraduates. Our funding body wants, I think, scientific output in the form of publications. Research staff, who are struggling with all three roles and trying to keep all three parties happy, almost always end up favouring their PI.

This is the crux of the problem – the inordinate influence of the PI and the closeness of the relationship between the PI and

the researcher. This symbiotic relationship was discussed in a recent article by Mario Campo in *Nature* and needs to be broken if research staff are to take control of their own careers.

This lack of information about career progression and prospects is particularly galling given that information and its analysis is the backbone of our work. I have been reliably informed that any school offering a master’s degree in business administration will be able to tell you the starting salaries of all its graduates. Very few, if any, research institutions will be able to provide this information, nor will most be able to tell you the percentage of their researchers who go on to permanent positions. It would be nice to have that information.

We would also like information on funding. To become independent I need money, but do not know where to turn for it. That may be because I am in a small institution, but there does not seem to be any central repository for information about funding sources.

Another information issue about which I feel very strongly is the lack of feedback to job applicants. If I spend a month writing a paper, I receive three pages of feedback from three referees. If I spend a month filling in a job application, I receive a line or a paragraph at best. I want to know why I am not getting onto shortlists. I want to know why people do not want to give

me jobs. Is it because of the field I work in? It might be; seaweed is not particularly sexy! If I were female, would it be because I was female? Is it because I have been too mobile? Is it because I have not been mobile enough?

The second thing we would like is greater opportunity to do what we are good at. According to most estimates, the UK ranks second in global scientific productivity, well behind the US but ahead of the rest of Europe. This gives the impression that the UK is extremely scientifically productive, but this comes at a cost. In a report published by the Chief Medical Officer a couple of years ago concerning the shortfall in clinical medical researchers, it was noted that staff were being stretched too thinly and that “there should be a clear recognition that it is rare for excellence to be achievable in research, teaching and management by a single individual”. What seems to occur far too often is that people are hired for their ability to do one thing and then forced by their department to do another. I would like to become a PI, but not if it means that I spend all my time doing administration. It is important for us, as research staff, to know that the jobs we are being selected for are the jobs we are good at. Exactly how that could be achieved is a matter for discussion.

Third, as research staff, we would like to be given more responsibility. We want to take responsibility for our careers and for developing the direction of our field and the area in which we work. We have much to offer, but at the moment there are very few opportunities for us to contribute. We would also like to take responsibility for developing younger researchers. I have around 10 years of experience in research but I am not formally recognised as being responsible for PhD students or younger researchers, even though I see them far more often than their PI does and carry out the bulk of their laboratory training.

This brings me to the fourth item on my wish list: we would like recognition, not just for authorship of papers but also for the support we give our institutions in securing research funding, the training we carry out, the laboratory management we provide and the part we play in developing other people’s research careers. The PhD process should involve learning to carry out one’s own research. Research staff posts should then be the first step in learning how to encourage other people to carry out their own research.

If these four areas are not addressed, my concern is that research staff will become nothing more than overpaid technicians or perpetual doctoral students. The loss to the UK’s research enterprise caused by the continuing disillusion of its researchers cannot be overstated. I am, therefore, keenly interested in finding ways of improving the lot of the 30,000 research staff working in the UK. □

How should international development policy be balanced between institution building, direct aid and capacity building? A meeting of the Foundation on 21 March 2007 discussed the issues.

The stark choices for development policy

Gordon Conway



Sir Gordon Conway KCMG DL FRS is Chief Scientific Adviser at the Department for International Development. In the early 1960s, he was one of the pioneers of sustainable agriculture. From 1970 to 1986, he was Professor of Environmental Technology at Imperial College, London. From 1998-92 he was Representative of the Ford Foundation in New Delhi. From 1992-98 he was Vice-Chancellor of the University of Sussex and Chair of the Institute for Development Studies. Prior to joining DFID he was President of The Rockefeller Foundation. He is a Fellow of the Royal Society and President of the Royal Geographical Society.

As the first Chief Scientific Adviser (CSA) in the Department for International Development (DFID), my focus differs from other Departmental CSAs in that it centres on science, technology, engineering and innovation *in relation to the needs of the developing countries*. Since my appointment this agenda has been increasingly prominent; for example in the report of the Commission for Africa in 2005, at the EU and G8 summits of 2005, in the DFID White Paper of 2006 and, most recently, at the Assembly of the African Union in Addis Ababa in January this year.

The 2006 International Development White Paper, *Making Governance Work for the Poor*, committed DFID to doubling its funding for research – especially for better drugs and treatments, cleaner water, increased agricultural production and managing climate change – to some £220 million by 2010. This will make us one of the biggest development science donors in the world.

The overriding objectives are to help a group of partner developing countries attain the Millennium Development Goals (halving poverty and hunger, greatly reducing child and maternal mortality, etc) by 2015 and achieve sustained economic growth. Our partners are predominantly ‘fragile states’ (such as Afghanistan, Sierra Leone and the Democratic Republic of Congo) and low income countries (such as Kenya, Uganda and Malawi). We also have more limited engagement with middle income countries (such as Vietnam and Indonesia) and the so-called BRICS (Brazil, Russia, India and China). Needless to say each of these categories presents different challenges in terms of building science and innovation capacity. In particular, the stark choices that we are asked to address are likely to be differently weighted.

The choices depend critically on the creation in developing countries of national innovation systems. It is this context – the existence or potential for such systems and their form – that the choices for developing countries, and therefore for the international donor community in responding to that demand,

have to be made.

First and foremost, I would argue, there has to be a clear policy decision at the highest level by national governments to develop science and innovation strategies. The recent statements by African presidents following the Addis Ababa Summit suggest that this is beginning to happen. A good example has been the development of a science and technology (S&T) strategy for Rwanda. Under President Kagame’s leadership, the key driver for *Vision 20/20* (Rwanda’s long-term national development plan) is the introduction of S&T into all elements of Government with the goals of helping to:

- stimulate a steady growth in GDP;
- advance the quality of life for all the citizens;
- improve skills and knowledge among the population;
- integrate technical education with commerce, industry and the private sector in general.

Rwanda is focusing on developing high value-added export industries in such fields as coffee, roses and pyrethrum. The new industries are based on subsistence farmers but the leadership in several instances comes from members of the Rwanda diaspora who provide ‘technological know-how, marketing and organisational savvy, and workforce training’. Rwanda is now seeking to incorporate science and innovation in the development of its Poverty Reduction Strategy Plan.

A key to success is for developing countries to become intelligent users of science and innovation. This has several aspects. First, policy makers have to foster and embrace a climate of intelligent use of science and technology. The key skills for such intelligent use are the abilities of:

- asking the right questions;
- setting these questions in the appropriate context;
- knowing where to seek answers;
- interpreting the answers;
- putting them into effective practice.

Then countries need to build the capacity to: acquire and use existing knowledge; produce and use new knowledge; and ensure it is available in an affordable form. This, in turn, requires that they connect

Inequalities in trade. It was suggested that the UK Government was just 'salving its conscience' by funding projects in poor countries while allowing trade barriers to remain in place which denied African farmers the chance to sell their goods at a reasonable price. Countries like Malawi would remain poor while trade barriers remain. In fact, though, it could be the case that regional trade will be more important in developing the economies of these countries than trade with the developed North. And it was noted that the developed world holds the key to unlocking the stalled world trade talks.

discussion

with the large number of well-funded innovation systems that are emerging as important global players.

A good example of such a global innovation system is the development of insecticide-treated nets for use in the control of malaria. Today, the most effective control of the *Anopheles* mosquitoes that carry malaria is to use bed nets treated with a pyrethroid insecticide. Their development began with work by the UK Medical Research Council's Laboratory in the Gambia in the mid-1980s. Village trials demonstrated that bed nets dipped in insecticide resulted in a 63 per cent reduction in deaths of children under five years of age. Subsequent large-scale trials in northern Ghana, coastal Kenya and the Gambia showed a similar effect.

The trials led to more efficient treatment of the nets, including 'dip-it yourself' kits, more durable nets and finally nets where the fibres were coated with an

insecticidal resin and hence lasted for 4-5 years without the need for re-dipping. Since 1998, insecticide-treated nets (ITNs) have been used in the Global Malaria Programme with great success. But use varies from country to country: the relatively high cost is a limiting factor.

This is now being overcome by programmes such as 'Social Marketing of ITNs' or 'SMARTNET' in Tanzania. Nets bundled with re-treatment kits are available in even remote places at \$2 each. There is also a national voucher scheme that targets pregnant women and infants, and provides free nets for the poorest. Social marketing is used to run press and media campaigns and to organise displays at traditional rural markets. Some three million nets are sold in Tanzania every year.

The innovation was truly global in extent. The research partnerships between MRC, the World Health Organisation (WHO) and the Wellcome

Trust were critical. So were fundamental developments in science and technology, notably the development of safe, photo-stable pyrethroid insecticides. The international dimension was crucial: in Tanzania the ATZ factory employs Chinese engineers, uses resin from ExxonMobil in Saudi Arabia and Japanese insecticide technology from Sumitomo in order to produce the long-lasting impregnated nets. And then there was funding from a wide range of international donors, including DFID.

There are large numbers of other, similarly configured global innovation systems. Some are huge (the development of an HIV vaccine for example) while others are small, (such as the development of new varieties of cassava).

In many respects these systems are like ocean liners criss-crossing the seas. For developing countries the challenge is to get on board, gain access to what is being produced, be able to judge what is appropriate for their needs, and maybe get into the 'engine room' and help to steer the ship in a more productive direction. To do this developing countries need to build their own national innovation systems complete with appropriate policies, a complement of entrepreneurs, a skilled workforce and well-developed institutions of research and education.

I believe that the choices between building institutions, direct support and capacity building can be made only in this context. □

Placing health at the heart of development

Vikram Patel



Dr Vikram Patel is Reader in International Mental Health and Wellcome Trust Senior Clinical Fellow at the London School of Hygiene and Tropical Medicine. He is a psychiatrist committed to a public health approach to mental health problems in under-resourced settings. His research has focused on the influence of social determinants on mental health and the treatment of mental disorders in community and primary care settings.

Health lies at the heart of many of the Millennium Development Goals (MDGs). These goals have many strengths and Britain is one of more than 190 nations that have signed up to them. There is a very clear-cut timeline for achieving them. Many countries have committed funds and all these countries have agreed that these goals need to be tackled.

In the last eight or nine years I have been working in India, supported by the Wellcome Trust, the MacArthur Foundation and other donors, developing and learning about programmes on maternal and child health. I have become increasingly interested in the prospect that, by building capacity in women and more specifically in mothers, we can actually achieve the kind of development goals we are aiming for.

One indicator of whether countries are achieving the first MDG – of alleviating poverty – is child malnutrition; halving the proportion of children who are malnourished is one of the most fundamental targets in judging whether a country is alleviating poverty. Child malnutrition is one of the most pernicious problems affecting poorer countries, and it is important also to acknowledge that it does not just bedevil the child today, but it increases the child's risk of dying tomorrow because of, for example, minor infections. Perhaps nowhere in the world is this problem as severe and as resistant to change as in South Asia. Half the children in South Asia are stunted or underweight according to UNICEF. The most recent statistics released by the Government of India in February show

that between a 1998-99 survey and one that was carried out last year, there has been less than a percentage point fall in the proportion of children under the age of three suffering from malnutrition. Malnutrition still affects nearly half the children in the region. Most of us in Britain (and in India too) are enamoured by GDP and by economic growth rates in south Asia. Sadly though, as the region becomes richer and becomes a food-exporting zone, it appears that half or more of the sub-continent's women and children do not get enough food.

Malnutrition is not only an issue of childhood; the data show that more than half the women of childbearing age are anaemic, which is a good indicator of their nutritional status. This figure actually represents a worsening in the nutritional status of women in South Asia compared to seven or eight years ago. Poverty is thus transmitted through generations. The malnourished child is a sick child, a sick child who is less likely to go to school and less likely to complete school, and this child becomes a sick adult who is unable to function competitively in a competitive society and so rise out of poverty. Because that person now lives in poor circumstances, he or she is likely to remain malnourished. In many parts of South Asia, women are particularly disadvantaged: the woman is more likely to be malnourished and on account of her malnourishment is more likely to have another malnourished child. This cycle perpetuates itself.

The dominant donor and policy response to child under-nutrition is direct aid (as represented by giving food aid). But it is time to ask the question: is giving food enough to actually tackle this problem? Ensuring food security is profoundly important and I do not mean to dismiss it. Without food, clearly we will not be able to tackle malnutrition; but the question we need to ask is how much impact has 60 years of food aid actually had on the problem? The Integrated Child Development Scheme of India (one of the largest nutritional intervention programmes in the world) has existed for more than a decade, but the figures I mentioned earlier from the national health surveys bear witness to their limited impact on rates of malnutrition. If anything, given the increase in population over the past 10 years, the number of malnourished children and mothers has actually grown, belying the theory that economic growth leads to a trickle-down effect and will on its own reduce poverty and malnutrition.

I would like to suggest an alternative approach, one that the Department for International Development accepted a

few years ago. It involves the empowerment of women who are the key caregivers, the ones who ensure that they and their children (and by wider association their families and their communities) are actually able to receive and use development aid effectively. In building capacity in mothers and families, we have a much more effective and sustainable long-term strategy for tackling the deep problems of poverty and malnutrition in many parts of the world.

At a systemic or macro-level, combating the pernicious gender disadvantage faced by women in the region lies at the heart of empowerment. However, at the individual level, what does empowerment mean? One definition that I have found useful is this: empowerment provides a state of wellbeing in which a mother realises her own abilities, can cope with the normal stresses of life, can work productively and fruitfully (very profoundly important for a mother who is also needed to look after and feed her baby) and is able to make a contribution to her community. This definition is almost identical to the one the World Health Organisation uses for mental health. I would like to propose, then, that at the individual mother's level, promoting mental health is equivalent to, or can be a powerful intervention for, their empowerment.

What evidence is available in support of this hypothesis? Consider first of all what happens to a mother when her mental health is severely impaired. There is a series of studies from South Asia on this subject, of which the best one is a large study from rural Pakistan. Investigators from the University of Manchester were able to show that mothers who were clinically depressed (the extreme end of poor mental health) were four times more likely to have babies who were stunted or undernourished at six months. Based on these findings, the forthcoming *Lancet* series on global mental health (due to be published in September 2007) commissioned researchers to carry out modelling to estimate what effect the treatment of depression in mothers in rural Pakistan might have. The results were striking. If we can scale up effective treatment for mothers who are depressed, we can avert as much as 20 per cent of the burden of stunting.

There is exciting new evidence that psychosocial interventions work better than nutritional interventions. Earlier this year, the *Lancet* published a series on child development which documented a number of clinical trials evaluating interventions to promote child nutrition and development. Trials in a number of developing countries showed, without

exception, that psychosocial interventions were far more effective than nutrition-focussed interventions in improving child growth and development outcomes, clearly again strengthening the case that building capacity in mothers was perhaps more valuable and more effective than simply providing food in the household.

These beneficial effects can be detected even a decade after they were implemented. A Jamaican study, involving researchers from the Institute of Child Health in London, reported in a paper in the *British Medical Journal* on the outcomes of babies, 11 years after the original intervention. Children in the psychosocial intervention group (now 12 or 13 years old) continue to show very significant advantages, one of the most remarkable being their educational performance. This suggests that simple strategies such as teaching and helping a mother to play with her baby actually provide consistent influences on brain development, the impact of which you can detect 12 years later.

Lastly, it is not just interventions with individual mothers that work. Tony Costello's group, again from the Institute of Child Health, reported a clinical trial in Nepal in the *Lancet* a few years ago evaluating the impact of a women's group empowerment intervention on maternal and infant health outcomes. Their work showed that the intervention, involving women talking with one another in a group to solve their problems and support one another, led to marked health benefits for their babies, reducing neo-natal mortality by 30 per cent, a staggering reduction. I propose that psychosocial stimulation and group interventions work, at least in part, by promoting maternal mental health.

So, to alleviate poverty should we actually give direct aid, or should we build capacity? If we look at the metaphor of direct aid, in terms of childhood malnutrition this would translate into food aid; if you had to look at building capacity in mothers, that might translate into empowerment – consisting of a variety of very different sorts of interventions, delivered in individual or group formats, and including methods such as: teaching and supporting mothers with parenting interventions; providing pre-school and after-school crèches so that mothers can both look after their babies and be economically productive as many mothers need to be; enabling groups of mothers to solve their problems about social and health concerns; and providing psychological and medical treatment for mothers suffering from depression.

How can we achieve this? Innovation is being led from Britain, by changing the way communities – and health workers who work in communities – deliver maternal and child healthcare. For example, the ‘Thinking Healthy’ programme, funded by the Wellcome Trust through the University of Manchester, is actually trying to change the way health visitors in rural Pakistan deliver their routine healthcare to depressed mothers. The aim is to move these health workers away from simply providing information about childcare (which is again the metaphor for direct aid) to

working with mothers and promoting their mental wellbeing. As a result, these women improve their abilities to care for their babies (which is a metaphor for capacity development in women). The researchers hope that the intervention will improve not just maternal mental health, but improve child nutrition outcomes as well.

Women’s empowerment is a critical requirement for alleviating poverty: I think the evidence base, which I have briefly described above, is robust and consistent. At the level of individual mothers, mental health promotion interventions

provide a conceptual model to empower mothers. A consortium of UK universities, involving the London School of Hygiene & Tropical Medicine, along with colleagues in the Institute of Child Health, Oxford University and the University of Manchester, with partners in South Asia and South Africa, are trying to build on this very powerful evidence base. The aim is to develop and test the feasibility and impact of scaling-up maternal empowerment programmes in developing countries on mothers and their babies, which is surely the most important group of individuals in their communities. □

Building success and development in the 21st century

Aleke Banda



The Hon Aleke Banda MP is President of the Peoples’ Progressive Movement (PPM) in Malawi. He was involved in the creation of Malawi as an independent state and has served as Minister in a wide range of ministries including Finance, Economic Development and Planning, Agriculture and Health. He was elected President of the PPM in January 2004 and is a Member of Parliament, Deputy Chairperson of the Public Accounts Committee, a member of the Business Committee of the Malawi National Assembly and a member of the Parliamentary Committee on Health and HIV/AIDS.

The Millennium Development Goals have been repeated so often that it is possible to lose sight of their importance or their significance to the lives of the poor. In Malawi we live with the reality of widespread, deep and pervasive poverty. Some 65 per cent of the population live on less than \$1 per day, while 53 per cent of children are stunted due to chronic malnutrition. Only 34 per cent of children complete primary school.

However, Malawi has made significant progress in terms of improving macro-economic management. As a result, it qualified for complete debt cancellation in October 2006. After a period of stagnation and even decline, the economy has registered a growth of 8.5 per cent during the past year. Inflation is down to 9 per cent from the high levels of 20 per cent and above, and interest rates have declined from 35 per cent to 20 per cent. For two successive years Malawi has achieved significant food surpluses.

Given the depth of poverty and serious resource constraints, the issue of aid effectiveness becomes even more important. The international community undertook to increase aid to 0.7 per cent of GDP in 2005 and the Paris Declaration was signed. Among the core elements of the declaration are the need to scale up for more effective aid, to increase alignment with partner countries’ priorities, systems and procedures, and to help them strengthen capacity.

The Paris Declaration is a significant breakthrough. It should ensure that aid is targeted on the poorest countries and is aligned with the priorities of the recipient governments, while strengthening accountability. In the past, donors

set up their own projects run by parallel implementation agencies with separate financial management systems. This led to significant fragmentation, duplication of effort and neglect of core priorities. It diluted national leadership and overstretched limited management capacity as senior Government officials tried to keep track of hundreds of projects and deal with separate review missions led by donors.

The move to Sector Wide Approaches (SWAP), where national and donor resources are pooled to support an agreed programme of work in line with national development priorities, demonstrates how aid can be made more effective. Malawi has operated a Sector Wide Approach in the health sector for two years. This supports the implementation of an Essential Health Care Package (EHP) which targets the principal causes of mortality and morbidity and is delivered free.

The Essential Health Care Package is an explicit prioritisation tool that focuses on the health needs of the poor. It consists of a number of services delivered at various levels of the health service: control and management of vaccine-preventable illnesses; reproductive health services, including family planning; and safe motherhood and the prevention of mother-to-child transmission of HIV. It also targets the major diseases, including: malaria; tuberculosis; acute respiratory infections; acute diarrhoea diseases like cholera; sexually transmitted infections; and HIV/AIDS. The EHP deals with the prevention and management of malnutrition, nutritional deficiencies and related complications and also with

Powering the developing economies.

Developed economies rely on plentiful electricity supplies. To take their place amongst the developed nations, the countries of the South need more widespread power networks. How can this be achieved in developing economies? Some speakers argued that solar power will have to provide much of the answer. However, even solar power requires some financial assistance and it was noted that it remains beyond the reach of many communities.

discussion

the treatment of common injuries. The Sector Wide Approach in support of the EHP has been extremely successful.

The successful implementation of this Sector Wide Approach demonstrates that it is not necessary to choose between 'institution building, direct aid or capacity building'. In line with the Paris Declaration, the SWAP has a governance structure (comprising technical working groups and an overarching health sector review group) which promotes accountability, transparency and engagement of all partners in the health sector, including civil society. The example of Malawi's health sector SWAP shows the importance of partnership. This is a very important lesson for development policy: that donors often fail to recognise, work with and strengthen existing capacity.

Another challenge is to create greater opportunities for Africa's young people. A new generation is emerging in Africa, anxious for change and concerned to alter the present rather than re-live the glories of past liberation wars. There is a need to exploit this energy and to create opportunities for the brightest youths who may have been deprived of formal education in their earlier years. There is clearly a need to expand tertiary level and vocational training for young people.

Development is partnership – it involves dialogue and also the need to recognise the considerable untapped potential that exists outside the formal sector. This is where we have to start re-thinking capacity development programmes. The capacity exists but we need to find more innovative ways of developing it and using it to accelerate the fight against poverty.

A poor country like Malawi requires solutions that encourage and involve the use of free natural resources such as solar and wind energies. There is a great deal of potential, for example, for developing large-scale irrigation schemes. Malawi has two distinct seasons – dry and rainy. There is abundant wind in the rainy season and plenty of sunlight in the dry. These two forms of renewable energy can be developed to

provide vast amounts of water for irrigation and adequate electricity to meet basic requirements for electrical power both in urban and rural areas. Hence the requirement for building institutions that can provide appropriate capacity and technical skills. Malawi may also need adequate direct aid to fund these tasks and to establish knowledge transfer partnerships with developed countries. These measures will assist Malawi to acquire progressive development that is sustainable.

Tobacco, our most important export commodity, is losing markets because of the anti-smoking lobby. Finding an alternative export to replace tobacco is one of the objectives of our development policy. No substitute has yet been found.

Diversification must also take the form of industrialisation. When we read accounts of countries like those of the Tiger Economies of the Far East, we notice that they attained real progress only when they started secondary and tertiary industries. If we continue merely with producing and exporting raw materials, Malawi will remain the Cinderella of the global economy. But how do we proceed? Here, again, we are talking about the need for the institutions of science and technology and the associated skills.

In a country at the level of development like Malawi, having to fix a balance between building institutions, direct aid and capacity building is not an easy task. However, though all these are absolutely

necessary, I would put capacity building as priority number one.

Malawi's natural and human resources must first be transformed into engines of growth. The natural intelligence of Malawians must, through training, be transformed into capabilities, their potential into achievement. Knowledge has always been acknowledged as a source of power. In the age of globalisation we notice that countries that have made a breakthrough in development have ample facilities for general and technical education. We need the kind of scientific and technological breakthrough that can breed the James Watts, the Richard Arkwrights and the Josiah Wedgwoods who laid the foundation of the British industrial revolution.

The Malawi government is in the process of building a University of Science and Technology in Lilongwe, the capital city. It will need all the direct aid it can get to equip the university with the facilities that would justify the name. All too often in developing countries, technical schools have been called colleges or universities. We need direct aid in staffing the university. We must be in touch with up to-date intellectual refinements.

Besides technicians and engineers, Malawi needs entrepreneurs. Since the privatisation of state industries in Malawi, we have been faced with the problem of finding indigenous buyers. There is as yet no sizeable body of entrepreneurs. What we have are petty shopkeepers, mini-bus operators, smallholder farmers, but no business people capable of holding their own in global markets.

Malawi has a free market economic system in which private ownership of property is guaranteed by law. Equally important is the requirement for Malawi to maximise the available opportunities for all members of the community to contribute to the development of science and technology that is critical for the continued success of the Malawi economy in this 21st century. Without the help and cooperation of the developed countries, these objectives cannot be met. □

Brain drain. One speaker commented

that there are more Malawian doctors and nurses in Manchester than Malawi. However, the establishment of a new medical school has meant that most medical students are now staying in the country for their training. A coordinated effort between the Government and its partners has also resulted in higher salaries for qualified medical personnel which has persuaded many to remain. While it is cheaper for basic training to be carried out 'at home', for higher degrees and specialist training it will continue to be important for people to go abroad. And indeed, many doctors and nurses return home after completing specialist training outside the country.

discussion

The cost of litigating Intellectual Property Rights

Hugh Laddie



Professor Sir Hugh Laddie QC is Professor of Intellectual Property Law at UCL and a consultant with a firm of IP solicitors. From 1995 to 2005 he was a judge in the High Court of Justice, Chancery Division, latterly being the senior judge of the Patents Court. He is a graduate of St Catharine's College, Cambridge, where he read Natural Sciences and Law. For over 25 years he practised as a barrister in England specialising in intellectual property law.

In a judgment given in April of 2006, Lord Justice Longmore said, "It is a well-known and rather disturbing fact that it costs far more to resolve intellectual property disputes in England than in other parts of the EEA [European Economic Area]. This case is a good example." This is not a new complaint. In 1892 Lord Esher famously said "that a man had better have his patent infringed, or have anything happen to him in this world, short of losing all his family by influenza, than have a dispute about a patent."

There has been a depressing consistency over the decades on this issue. Recently the European Patent Office gathered information on the relative costs of patent litigation across Europe. In a report published in February last year it disclosed that to litigate a small to medium sized patent case in England cost anywhere between three and 10 times as much as to litigate the same case in Germany or the Netherlands. There is little doubt that these figures represent, at least qualitatively, the difference between litigation here and in the courts on the Continent. The recent Gowers Review published in December 2006 stated that a company wishing to challenge a patent through the courts could expect to incur costs of £750,000 and nearly double that if had to bear the other side's costs as well. And this was for a simple case. These figures accord with what the users of the system, namely clients, believe.

Early this year I participated in a lecture tour of India. The message received from Indian businessmen (including representatives of large multinational companies) was consistent and depressing. They admired the quality of British justice and judgments but they would not litigate in England if they could avoid it. English proceedings were too expensive. Shortly after this, I participated in a conference in Finland. One of the speakers was a senior executive of one of the largest Finnish companies. Part of his presentation consisted of an exhortation to others only to litigate patent disputes in Germany. There you could obtain competent justice at reasonable cost.

Not everyone in the English legal system is concerned. Recently, when the issue was raised with a senior person in the patent field his response was that

things were not really that bad, as evidenced by the fact that the diary of the Patents Court in London (part of the High Court) was very busy for the next 15 months. In a similar vein perhaps Marie-Antoinette would have said that the cake shops in France were busy.

However, a dispassionate examination of the figures shows how bad the position is. Last year there were about 500 patent trials in Germany. In England there were just 12 which reached judgment at first instance. No judge in that court heard more than four patent cases which went all the way to judgment. There would have been a small number of additional patent trials conducted in that period in the Patents County Court, but the total number of trials in the two courts will have been less than 20.

So Lord Justice Longmore was right to comment on the high cost of litigation in England. However, if he was intending to single out IP litigation for condemnation, he was wrong to do so. The Patents Court has been at the forefront of refining and slimming down High Court litigation. Starting with Mr Justice Jacob (as he then was), for the past 15 years there has been an aggressive attempt to streamline procedure. Most things have been tried including limiting (though not abolishing) the automatic obligation on litigants to disclose, and if necessary to supply copies, of all their internal documents, whether helpful to their case or not, to their opponents – the process known to lawyers as 'disclosure' or 'discovery'. The cost and burden of English court proceedings were so well known that only a few years ago the then Lord Chief Justice, Lord Woolf, supervised a revision of court procedures. However, most of the features of the Woolf reforms which have worked – and many of them have not – had been introduced earlier by the Patents Court. The result has been that, in most cases, a trial in the Patents Court now is far shorter than would have been the case 20 years ago. Yet costs are stubbornly high.

The problem with IP litigation, and particularly patent litigation, is not that it is peculiarly expensive by English standards but that, unlike other types of litigation, it is so easy to compare like-for-like with equivalent litigation

on the Continent. The issues that will be raised in an English patent action are virtually identical to those which will be raised in a German or Dutch action concerned with the equivalent (and frequently identically worded) patent. Furthermore, litigants frequently can choose where to litigate and when they do the vast majority opt for litigation on the Continent.

What, then, is the cause of this unhappy state of affairs? Very recently Lord Justice Buxton was reported as protesting at the high costs incurred in a personal injuries action before him. He accused the lawyers of being "greedy". After two recent spectacularly expensive pieces of commercial litigation came to an end, it was suggested at a very senior level that the judges were to blame for having failed to control the course of the trials. I do not believe there is any evidence to suggest that these criticisms apply across the board. English lawyers are not, as a group, significantly more greedy than their Continental colleagues and to blame judges for failing to control trials is to complain at the stableboy who closes the stable door too late. By the time the case gets to the judge, the costs largely have been incurred.

The problem is that the English system is labour-intensive. Lawyers expect to be paid for their work, whether they practise in England, Germany or Holland. If they need to do more work in English litigation than in equivalent proceedings on the Continent, the final bill will be higher as a consequence. As the majority of practitioners agree, the Woolf reforms have done little to improve the situation. In some cases they have made the costs burden worse.

Any civil lawyer will identify why our proceedings cost so much; lengthy cross-examination and oral argument and, more than anything else, disclosure of documents. The latter exercise, which supports and amplifies cross-examination and the length of submissions, is both expensive and, in the overwhelming majority of cases, yields meagre returns.

The English system hangs on to these procedures with touching loyalty. It may well be that for the very large commercial disputes (e.g. patent actions between large pharmaceutical companies or corporate fraud cases) the expense of all of this is proportionate to what is at stake. In such cases there may be good reason to continue with the current Rolls-Royce system. But, unfortunately, that system is all that is available to the vast majority of litigants who have more modest legal disputes. The result is that they are either deprived of access to the court or, if they are lucky and their dispute crosses the Channel, they may be able to litigate there.

'If lawyers need to do more work in English litigation than in equivalent proceedings on the Continent, the final bill will be higher as a consequence.'

A legal system which is outside the financial reach of the vast majority of the population undermines the rule of law. On a number of occasions the Government has expressed concern. Indeed, the Department of Constitutional Affairs' own website refers to a 1994 article identifying costs as having created "a state of crisis" in civil litigation. The Government has addressed the problem as far as its legal bills are concerned by reducing the availability of legal aid and what is paid to lawyers doing legal aid cases to the point where it is often no longer commercially worthwhile to do that sort of work. It has also reduced the burden on the Treasury by raising the cost to litigants of issuing proceedings to the extent that, it has just been announced, it has made a £45.5 million profit on the civil courts. But it is shameful for the Government to look after its own budget and even make a profit out of the legal system yet leave the vast majority of the population, including many SMEs, with a system they cannot afford.

Until a radical new approach is adopted, litigation here will continue to be beyond the reach of most litigants, including foreign companies who would otherwise be attracted by the quality of our lawyers and judges. Perhaps it is time to do the unthinkable and start

making our system much more like that used by our Continental colleagues.

It is possible to dismiss this problem as one which only afflicts those who have the misfortune of being involved in litigation. However, this understates the mischief. Consider the impact on Intellectual Property Rights, such as patents, registered designs and copyright. The economic justification for all of these is that the market exclusivity created by these rights means that the owner of them can charge higher prices and thereby make a greater profit. This financial incentive encourages investment of time, money and manpower in the innovations which create the IP rights. However, if the cost of litigation is too high to bear, most medium and small owners of these rights will not be able to afford to obtain through the courts the exclusivity which the rights promise. Furthermore, the big players can use the cost of litigation as a weapon against smaller rivals. The result is that it is easier for them to ignore other people's rights and enforce weak rights of their own.

It would be an exaggeration to say that expensive litigation destroys the economic foundation for IP rights but it certainly diminishes its attraction to smaller players. My personal experience has been that excessive costs also leave all but the largest companies resenting the diversion of funds which could be better spent, for example, on more research and development.

It is not only medium and small enterprises which suffer. We can look across the Atlantic to see what is coming. In the United States there is growing concern at the activities of what are known as 'Patent Trolls'. These are small companies which buy in parcels of patent, for example from liquidators of research companies. Once they have gathered a large enough portfolio in a particular area of technology they threaten proceedings against all and sundry. The cost of litigation and the risk of large awards of damages and court injunctions results in even large companies buying off the Trolls. There are some features of the US system which makes it particularly prone to this sort of abuse; even higher costs of litigation, contingency fees, jury awards of damages and so on. However, the same disease can confidently be expected to strike here. The cost of litigation is one of the factors which will nourish it. □

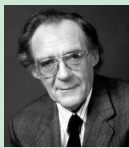
Summaries of the discussions and many of the speaker presentations from events organised by the Foundation can be found at:

www.foundation.org.uk

Should data and findings from the Intergovernmental Panel on Climate Change be made available on a more regular basis?

How to keep the world up to date on climate change

John Maddox



Sir John Maddox FRS is Editor of *FST Journal*. A trained physicist and chemist, he was editor of *Nature* for 22 years. He was director of the Nuffield Foundation from 1975-1979. He is a Trustee of Sense About Science.

On the first two days of March this year, the Royal Society's headquarters in London saw what was billed as the 'launch' of the Fourth Assessment of the global climate by Working Group I of the Intergovernmental Panel on Climate Change ('the Panel' in what follows). The place was crowded with 1,000 people. Even the satellite room, with live audio-visual relays from the main hall and the facility for asking questions, was over-full most of the time. The youth of those crowding the building – mid 30s to mid-40s – seemed in sharp contrast with the Panel's own antiquity.

The Panel was created in 1988 – nearly 20 years ago – when the UN Environment Programme and the World Meteorological Organisation petitioned their parent body for its creation. The two UN agencies continue to provide the secretariat, which is thoroughly international (important documents are published in six languages). The Panel was the driving force behind the UN Framework Convention on Climate Change (1992) and the Kyoto Protocol (1997). The total cost of its activities is not publicly known, but much of it falls on the academic institutions that have agreed to accept responsibility for particular functions.

The periodic assessments constitute the hard core of the Panel's activity (but there is also a task force responsible for the techniques of measuring greenhouse gas emissions and for collecting data thereon). Work on the Fifth Assessment has begun already. These exercises lead to published volumes from each of the three working groups, which deal respectively with (I) the physical state of the climate, (II) the effects of climate changes on the physical and the socio-economic environments and the prospects for adaptation, and (III) the prospects for mitigation.

The conference in March exuded something of the air of a reunion meeting, although many of the participants had never set eyes on some of those to whose texts they had contributed. Some

wistfully complained of the editorial regime: one that the surface layers of the oceans merited more than the single sentence she had been allowed. Time and space constraints showed in other ways: one speaker, blessed with 15 minutes on the programme, had apparently taught himself to speak at 300 words a minute, defeating aging ears such as mine.

On balance, however, Working Group I proved its point: that global warming is happening as we speak, that the prime cause is the accumulation in the atmosphere of greenhouse gases, that temperatures and sea levels will continue to increase and that we shall all be in serious trouble unless something is done.

Indeed, it is difficult to believe that an open-minded person could have sat through the proceedings without being persuaded of that chilling proposition. For one thing, the talks were models of sobriety, without triumphalism. The huge amounts of detail in people's presentations were proof that they had considered everything they could think of. It was also impressive that several reasons for disputing the global warming scenario were quietly disposed of. For example, three years ago it seemed that the rate of warming at the surface of the Earth and that in the upper troposphere and lower stratosphere was less than that required by the increasing measured temperature at the surface of the Earth. That discordance has now been banished, apparently justifiably, by the re-calibration of the infrared satellite data on which the atmospheric numbers were based.

None of this implies that the computation of global warming has been settled once and for all. Many speakers in March agreed that there is a need to refine the grid on which computer models of global climate are based (as things are, the country of Ireland is the equivalent of a single point on the surface of the Earth.) The outcome of such developments would be better regional predictions. Ocean currents similarly need to be better understood if the

Phenomenon and direction of trend	Likelihood that trend occurred in late 20th century (typically post 1960)	Likelihood of a human contribution to observed trend	Likelihood of future trends based on projections for 21st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	Very likely	Likely	Virtually certain
Warmer and more frequent hot days and nights over most land areas	Very likely	Likely (nights)	Virtually certain
Warm spells/heat waves. Frequency increases over most land areas	Likely	More likely than not	Very likely
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	Likely	More likely than not	Likely
Areas affected by droughts increases	Likely in many regions since 1970	More likely than not	Likely
Intense tropical cyclone activity increases	Likely in some regions since 1970	More likely than not	Likely
Increased incidence of extreme high sea level (excludes tsunamis)	Likely	More likely than not	Likely

Table 1. Recent trends, assessment of human influence on the trend and projections for extreme weather events for which there is an observed late-20th century trend. Source: IPCC Fourth Assessment Report (Working Group I). The following terms have been used to indicate the assessed likelihood, using expert judgment, of an outcome or a result: Virtually certain > 99% probability of occurrence, Extremely likely > 95%, Very likely > 90%, Likely > 66%, More likely than not > 50%, Unlikely < 33%, Very unlikely < 10%, Extremely unlikely < 5%.

models are to be robust, although the rapid accumulation of understanding of the El Niño phenomenon in the Pacific should encourage the authors of the Fifth Assessment.

Meanwhile, there is a strong case for the Panel to carefully consider some of the difficulties that cropped up at the London meeting, the chief of these being its publications regime. Throughout the

two days, nobody had a printed copy of the report of Working Group I. Indeed, that will appear only in September (from Cambridge University Press), although the text is already available on the Panel's website. The consequence was that those not already privy to the working group's arguments and conclusions were often in the dark at the Royal Society meeting.

It is a curious sensation to be sitting in a crowded room listening to highly technical talks about a document that will not be available for several months. It is also a curious practice for an organisation such as the Panel, which in the past has been deeply resentful of suggestions that it is a cabal of academics bent on making people afraid of the future.

There is no easy way around the problem. It does take time to edit books that run to 1,000 pages, especially when they are lavishly illustrated with technical diagrams. Dispensing with the printed text altogether would not yet be a feasible alternative – surfing the web in a crowded lecture-hall is not socially acceptable, while posterity deserves a permanent record of how the Panel reached its conclusions.

The remedy may lie in the Panel's way of working. It is easily appreciated that setting the goal of another assessment every four years or so will give the whole organisation something tangible to work towards, but the successive assessments are to some degree repetitive. Annual publications, in which published judgements were refined or amended, would serve the purpose just as well. New readers would no doubt be incommode, but those knowing the earlier publications would save time.

As it happens, there is within the UN system itself an alternative way of publishing highly technical material that might provide a feasible alternative to the Panel's procedure. In the 1950s, the UN Scientific Committee on Atomic Radiation (USCEAR) was established. The purpose was to inform a wide range of governments and public institutions of the dangers of particular radiations. Its publications were among the first to draw attention to the potential hazards of radon in people's houses, for example. These reports were published on an annual basis.

If the Panel were to follow some such course, there would be some immediate benefits. An annual publication would more effectively keep the Panel's work in the public eye than the present sporadic schedule. There is little danger that climate change as such will become a dead issue, but public concern needs more guidance than it will get from the general press. □

No, minister. Do as I say!

Archimedes

Archimedes is an experienced observer of the evolution of public policy who contributes occasional comments on the character of the debate at the Foundation's dinner discussions.

The traditional relationship of ministers and civil servants is clear. Ministers are answerable to Parliament for decisions taken by civil servants in their name. These anonymous civil servants advise and implement policies and make decisions in accordance with what they think their minister would expect. They are answerable to the minister and to no-one else – not to Parliament, nor the public. The minister alone decides whether to accept or reject their advice, which is confidential to him. Any public statement made by a civil servant – whether to Parliament, in appearance before a committee, or to the media, is made in the minister's name and must accord with his instructions. As Lord Armstrong put it: "The duty of a civil servant is first and foremost to the minister of the Crown who is in charge of the Department in which he or she is working."

But life is never so simple. The collaborative and hierarchical culture of the civil service, the politicians' priority to avoid blame and seek approval, have always led to tensions and loyalties within the relationship. Increasingly, the Government's involvement in all areas of life requires the delegation of innumerable individual decisions. Ministers, understandably, resist responsibility for these decisions so those delegated, particularly but not exclusively in agencies, may be held answerable. Even so, the basic constitutional principle has held.

Two new interrelated factors could undermine that principle. The first is the demand, so strongly supported in FST discussions, for 'evidence-based' policies; the second, also supported in those discussions, is the pressure for ministers to have advisers with outstanding professional status, to judge the quality and implications of the evidence. Taken together, these factors could limit the ability of ministers to consider all options, and question the primary loyalty of those advising them.

'Evidence based' implies, first, that research establishes the evidence – research which may take some time, be expensive, involve indicating to the outside world what possibilities are being considered, and never be conclusive. A minister's options may be foreclosed because he cannot act quickly, or he may face a political fuss when it is known that an unpopular idea is being considered.

Second, the evidence requires interpretation and evaluation. For example, concerns about the reading ability of children might lead to pressure on ministers to produce a new policy rapidly. Quick research may show that, taught to read in a certain way, children read better; but does this research adequately consider different ethnic and gender factors? What is the experience in other countries? The minister has to be advised whether the evidence is strong enough to approve a new policy

(and be enough to counter those who claim it is an infringement on teachers' freedom) or that it is not strong enough, that more work is needed and that he will be told the answer after the next election. If the educational expert concerned considers the evidence insufficient – and his views become known – a minister committed to 'evidence-based' policies will find such views difficult to ignore.

The qualification is 'if his views become known'. Yet they will be – even putting aside the effects of the *Freedom of Information Act*. No longer will advice to ministers necessarily be protected by the civil service culture of absolute loyalty and discretion.

The commissioning and assessment of evidence needs to be carried out by an expert 'with outstanding professional status'. By definition, his name will be known and his loyalty, built over many years as an academic or researcher, will be to the values of his peers. Their approval is more important to him than that of the minister. He can leave the Department and go elsewhere. If his advice is disregarded, he will want to make sure that his peers know what he said. To maintain his authority, he will want to make his views clear, whatever the problems for the minister.

In short, the ability of ministers to take decisions for which they are responsible to Parliament is inhibited.

Should we be concerned? Surely anything which inhibits ministers from producing hasty, ill-considered policies – often in response to hysterical media pressure – must be beneficial? FST discussions have warmly welcomed the outsourcing of technical decisions to bodies such as NICE, FSA, and the MPC; frowned on ministerial attempts to subvert them (and loftily ignored questions about accountability and sensitivity to possibly irrational public concerns). Evidence-based policy and publicly-known expert advice, are surely simply further welcome developments?

Probably, but be careful. Do not throw the baby out with the bathwater. If we want our form of democracy to continue, Parliament must be able to hold ministers to account and an elected government must be able to respond to the electorate's views. This means that the views of experts must be capable of being overridden. Ministers must have genuine freedom to take decisions based on political, administrative and legal considerations – which may not accord with professional advice. They must have and, if they so decide, follow, advice from others who adhere to the traditional Armstrong doctrine. Advisers of 'outstanding professional status' appointed to Departments must accept this and understand that, in a difficult political arena, discretion and loyalty to a minister are crucial. □

The 2006 Lord Lloyd of Kilgerran Award was made to Professor William Hardcastle at a special meeting of the Foundation on 5 December.

Understanding the gift of speech

To commemorate the rich life of its second chairman and first president, the Lord Lloyd of Kilgerran, the Foundation for Science and Technology makes an award of £2,000 each year to a person who has applied science and technology for the benefit of society. The winner of the 2006 prize was Professor William Hardcastle, Director of the Scottish Centre for Speech Science and Research, and also Professor of Speech Science at Queen Margaret University College, Edinburgh.

Professor Hardcastle is responsible for internationally renowned work in the development of electropalatography (EPG), a technique which records contact of the tongue with the roof of the mouth during speech. The Award was made to Professor Hardcastle for his development of novel techniques to observe what is happening inside the mouth during normal speech. These can be used to assist patients (particularly children) with defects to improve their speech by helping them observe how the tongue moves during speech.

The Lord Lloyd of Kilgerran Award has been made annually since 1993, when Alilsa Swarbrick and Sir Alec Jeffrey FRS were joint winners. Alilsa Swarbrick was honoured for her work in organising and running the successful Women in Technology Project which retrains women after time away for children. Sir Alec Jeffreys' award was in recognition of his role in the development of DNA fingerprinting. James Dyson and Tim Smit are also among the prizewinners.

Speaking at the award ceremony about EPG, Professor Hardcastle noted that: "We originally developed the technique as a tool for phonetic science research but the potential applications of the device for speech and language therapy in the assessment, diagnosis and treatment of speech disorders soon became apparent. With the help of funding from a number of sources such as the MRC, ESRC, CSO in Scotland and various major charities we were able to develop this aspect of the work further. Along the way, we set up a spinout company at Queen Margaret University College called Articulate Instruments, which sells and promotes the device. I am pleased to say it is used in over 50 research and clinic centres worldwide and there are at least 750 research papers in international journals



Professor William Hardcastle (right) receiving his award from the Chairman of the Foundation for Science and Technology, the Earl of Selborne.

describing work with the technique."

He added: "It has been a fascinating journey because the technique has opened

whole new areas of investigation into speech processing for me and my team at the Speech Science Research Centre at Queen Margaret and has encouraged us to view thorny issues, such as the nature of complex speech disorders, in a new light. We have seen real improvements in the speech of people with a wide range of communication problems after EPG therapy and we would like to think our work has influenced policy decisions in the profession and the way clinicians approach therapy for certain types of speech disorders."

The Lord Lloyd of Kilgerran Award is made annually and nominations are welcomed by the Foundation. For more information, please contact the Foundation for Science and Technology via email at office@foundation.org.uk, or by telephone on 020 7321 2220. □

Previous winners of the award

- 1993 – Alilsa Swarbrick** for organising and running the Women in Technology Project; and **Sir Alec Jeffreys FRS** for the development of DNA fingerprinting.
- 1994 – Dr Bridget Ogilvie**, Director of the Wellcome Trust, for her role in the organisation of medical research.
- 1995 – Professor Alan F Newell FRSE** for the application of computer systems in rehabilitation and therapy.
- 1996 – Professor Sir William Stewart FRS FRSE** as 'father' of the Science White Paper and for introducing the Technology Foresight initiative; and **Professor W Graham Richards** as a pioneer of computer-aided molecular design
- 1997 – Sir Tim Berners-Lee** for creating the basic protocols for the world wide web.
- 1998 – Dr Ian Wilmut** for the use of embryo manipulation techniques in farm animals in the development of biomedical applications and improved livestock breeding.
- 1999 – Professor Jane Plant CBE** for the development of simple, cost-effective methods of minimising the impact of contamination of the environment, and particularly human health.
- 2000 – James Dyson CBE** for the imaginative use of technology to assist the consumer, including the Dyson cyclone vacuum cleaner.
- 2001 – Nick Millard** for leading a team at Southampton University developing an autonomous vehicle for remote collection of oceanographic data.
- 2002 – Professor John Burland FRS FREng** for his contribution to engineering, including his novel work to save the Tower of Pisa.
- 2003 – Tim Smit CBE** for his single-minded vision to create the Eden Project.
- 2004 – Dr Richard Durbin FRS** for his creation of software enabling researchers across the world to access genome sequences.
- 2005 – Dr Helen Lee** for applying technology to diagnostic development and creating 'test and treat' regimes.

Recent dinner/discussions organised by the Foundation are listed below. Sponsors, for whose support we are very grateful, are shown in italics below the event. Summaries of these and other events are available on the Foundation website at www.foundation.org.uk.

10 July 2007

The Changes to the Machinery of Government

Sir Keith O’Nions FRS, Director General, Science and Innovation, DIUS
The Lord Broers FRS FREng, Chairman, House of Lords Select Committee on Science and Technology
Phil Willis MP, Chair, House of Commons Select Committee on Science and Technology
The Royal Society

20 June 2007

The Energy White Paper

Willy Rickett, Director General, Energy, DBERR
John Miles, Chairman, Global Consulting, Arup
Barry Neville, Head of Public Affairs and European Policy, Centrica
Institution of Engineering and Technology, Carron Energy and Institute of Physics

5 June 2007

How should government support innovation in the economy?

Jonathan Kestenbaum, Chief Executive, NESTA
Anne Glover, Co-founder and Chief Executive, Amadeus Capital Partners Ltd
Peter Warry FREng, Chairman, Science and Technology Facilities Council
Professor Rod Coombs, Vice-President, Innovation and Economic Development, the University of Manchester
Engineering and Physical Sciences Research Council, QinetiQ, South East England Development Agency and Science Technology Facilities Council

23 May 2007

Can biofuels offer a significant contribution to low carbon energy supply?

Lord Oxburgh KBE FRS, Chairman, D1 Oils
Sir Howard Dalton FRS, Chief Scientific Adviser, Defra
Ingmar Juergens, UN Food and Agriculture Organisation (FAO), Rome
BBSRC, Institute of Biology and Defra

5 May 2007

Risk, responsibility and regulation: whose risk is it anyway?

Rick Haythornthwaite, Chairman, Better Regulation Commission
Sir David Omand GCB, King’s College London
Verena Ross, Director, Strategy & Risk Division, Financial Services Authority
Institute for Statecraft and Governance, BP and Defra

21 March 2007

The International Development Challenge

Sir Gordon Conway FRS, Chief Scientific Adviser, Department for International Development
Dr Vikram Patel, London School of Hygiene and Tropical Medicine
The Hon Aleke Banda MP, President, Peoples’ Progressive Party, Malawi
British Council, The Wellcome Trust and The Royal Academy of Engineering

7 February 2007

How can we develop a better career path for young researchers?

Professor Wendy Hall FREng, Head, School of Electronics and Computer Science, University of Southampton
Sir Graeme Davies FRSE FREng, Vice-Chancellor, London University
Dr John Bothwell, Postdoctoral Researcher, Marine Biological Association
Council for Science and Technology, Department for Innovation, Universities and Skills

17 January 2007

The Cooksey Inquiry

Sir David Cooksey GCB, Chair, Cooksey Inquiry
Professor Colin Blakemore FMedSci FIBiol Hon FRCP FRS, Chief Executive, Medical Research Council
Professor Sally Davies FMedSci, Director Research and Development, Department of Health
The Hospital Saturday Fund and GlaxoSmithKline

15 November 2006

Scientific advice, risk and evidence-based policy making

Phil Willis MP, Chair, House of Commons Select Committee on Science and Technology
Professor Paul Wiles CB, Chief Scientific Adviser and Director, Research, Development and Statistics, Home Office
The Rt Hon John Gummer MP, House of Commons
Pitchill Consulting and QinetiQ

8 November 2006

Stern Review on the economics of climate change

Sir Nicholas Stern FBA, Chair, The Stern Review on the economics of climate change
James Smith, Chairman, Shell UK
Andy Harrison, Chief Executive, easyJet
Professor Sir Partha Dasgupta FBA FRS, Frank Ramsey Professor of Economics, University of Cambridge
AREVA, The British Council, Defra, Lloyd’s and The Royal Society

2 November 2006

Science Education - are we losing the plot?

Professor Anne Glover FRSE, Chief Scientific Adviser, Scottish Executive
Professor John Holman, Director, National Science Learning Centre, York and National STEM Director, DFES
Bob Kibble, Senior Lecturer, The Moray House School of Education, University of Edinburgh
Gatsby Educational Foundation and the Institute of Physics

25 October 2006

What are universities for?

The Lord Rees of Ludlow OM PRS, President of The Royal Society
Professor David Eastwood, Chief Executive, Higher Education Funding Council for England
Nick Butler, Group Vice President, Strategy BP, and member of the Advisory Board for the Centre for European Reform
Comino Foundation, EPSRC and QinetiQ

18 July 2006

Sustainable Development - how should policy and business decisions reflect pressures on natural resources and global climate?

Barry Gardiner MP, Minister for Biodiversity, Department of Environment, Food and Rural Affairs
Professor Alan Thorpe, Chief Executive, Natural Environment Research Council
Dorian Emmett, Head of Sustainable Development, Anglo American
The Natural Environment Research Council

11 July 2006

Pensions Policy – What are the liabilities for government and business and how should they be managed?

The Rt Hon the Lord Turner of Ecchinswell, Chairman, Pensions Commission
Alison O’Connell, Director, Pensions Policy Institute
Dr Reg Hinkley, Chief Executive, BP Pensions Fund
The Gatsby Foundation

21 June 2006

How is technology changing the nature of broadcasting?

John Dickie, Head of Public Affairs, BBC
Anthony Lilley, Chief Executive, Magic Lantern Productions
Professor Philip Esler, Chief Executive, Arts and Humanities Research Council
Arts and Humanities Research Council

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Comino Foundation	London School of Hygiene & Tropical Medicine	The Royal Society of Edinburgh
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