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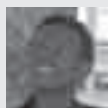
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The Sainsbury Review

There was a flurry of Government activity in science policy at the start of October. First, Lord Sainsbury's review of science and innovation policies, that had been expected earlier in the year, was finally released. A few days later, the 2007 Pre-Budget Report and Comprehensive Spending Review were published and the Government also announced that it was accepting Sainsbury's recommendations.

The big financial news was confirmation that the total public investment in the science base will rise from £5.4 billion in 2007-8 to reach £6.3 billion by 2010-11. The single fund for health research will rise to £1.7 billion by 2010 (independent of any future investment for the new molecular biology lab in Cambridge and the proposed international science centre in London). This should be great news for science.

However, our enthusiasm is tempered by the decline in government departmental research spending that is acknowledged in the Sainsbury Review. Over the last decade, while there has been a major increase in the so-called science budget, there has been a corresponding decrease in the amounts the other government departments spend on science. In 1997-98, the science base received 0.28% of GDP. R&D in civil departments was 0.16% and in defence 0.28%. This made a total of 0.72%. In 2005-06, the figures were 0.37%, 0.12% and 0.18%, respectively, making a total of 0.67% of GDP. It's not clear why the government has made this shift, or even if it was done consciously at all, but it may help explain why the government wants there to be more outside influence on what the Research Councils choose to fund (see page 12).

The Sainsbury Review, entitled *The Race to the Top*, gives us an idea of what government science policy is likely to be over the next few years. Sainsbury begins by pointing out that it is obvious that we cannot compete on costs with countries like China and India. Even if we could, as their workers earn more, other low-cost competitors will appear. We should instead be supporting the restructuring of

British companies into high value goods and services. We have many advantages: a flexible labour market, an extraordinary record of scientific discovery, a large supply of high-quality university graduates, and an open economy and international outlook.

He acknowledges that the UK lags behind many competitors in the quantity of industrial research and the volume of patenting. Much of the reason for this, he argues, is that UK companies are strong in sectors where relatively little R&D is reported. Consequently, instead of trying to raise R&D across the board, we should focus on the four major goals developed by the Technology Strategy Board (TSB):

- To help our leading sectors and businesses to maintain their position in the face of global competition
- To stimulate those sectors and businesses with the capacity to be among the best in the world to fulfil their potential
- To ensure that the emerging technologies of today become the growth sectors of tomorrow
- To combine all these elements in such a way that the UK becomes a centre for investment by world-leading companies.

In achieving these goals, we have to consider the different requirements of manufacturing and services and especially to understand how innovation takes place in the very different industries that make up the services sector. We also have to create a "diversity of excellence" in universities. Research, teaching and knowledge transfer are fundamental roles for any Higher Education institution, but the way they are done, and the educational experience offered to students, will vary greatly across the sector. Lord Sainsbury makes a number of policy recommendations:

- The TSB should be given a new leadership role, working with Regional Development

Continued on Page 12

Cutting Edge Collaborations

When speaking with our members we often find that they have struggled to successfully manage collaborations between industry and universities. In response to this, CaSE has organised a one day conference on February 1st 2008 for delegates to gain from the experience of successful collaborators and entrepreneurs. These goals will be increasingly important as universities come under more pressure to achieve targets for technology transfer and economic gain. Find out more about the conference and our key-note speaker, Professor Martyn Poliakoff, on pages 6 and 7.

They were assisted by Sarah Hyland who has joined us temporarily to help cover the gap and found herself doing all sorts of things, including writing articles for this issue of CaSE News.

Caroline Holland

Our part-time Membership Officer, Caroline Holland has moved on from CaSE. While her chief responsibility was encouraging new members to join and also helping us to ensure that existing members continued to be involved, like everyone else in the CaSE Office, Caroline made other contributions as well, for example in commissioning articles for CaSE News. She was also a source of useful advice on all sorts of matters. Caroline was heavily involved in organising our conference on Cutting Edge Collaborations, see pages 6-7 and we are pleased that she will be joining us on the day. In the meantime, we'll miss Caroline and wish her well.

Julia Harley, Head of Science, Thomas Hardy School, Dorset; Professor Ian Haines, Director of the Graduate School, London Metropolitan University; Dr Chris Kirk, Chief Executive, Biochemical Society; Professor Ray Allen, President of the Engineering Professors' Council and Professor of Engineering, University of Sheffield.

If you have any issues that you wish to raise with CaSE and you'd like to discuss them first with an EC member, these are suitable people to approach, as of course are the full members of the Committee. There is a full list of EC members on the CaSE website.

We welcome three new full members of the EC who were elected at the October AGM: Dr Judi Ellis, Head of School of Psychology & Clinical Language Sciences, University of Reading; Professor Anthony Finkelstein, Head of Department & Professor of Software Systems Engineering, University College London; and Dr David Hollingshead, Director, Science Policy, AstraZeneca

Philip Wright of the Association of the British Pharmaceutical Industry has resigned from the EC on account of pressure of work. We are grateful to him for his contributions during the time he was on the EC.

Finally, if you think there are areas (subject or geographical) that are not adequately covered, or you want to suggest someone, or volunteer yourself, as a candidate for future election to the EC, please let us know.

New Faces



We are pleased to announce that Nick Dusic has been appointed as the new Director of CaSE, replacing Peter Cotgreave

who has become Director of Public Affairs at the Royal Society. Nick comes to us from the British Ecological Society, where he was Science Policy Officer. He'll be starting in December and will introduce himself in the next issue.

We have also appointed David Hawksett to the part-time position of Membership Officer, replacing Caroline Holland. His "story thus far" is on page 10.

Replacing two staff in such a small office inevitably meant that things were a bit tight for a while. You probably didn't notice this, and for that we are grateful to Hilary Leever and Susan O'Dwyer who both took on extra duties and made sure everything ran smoothly during the transition.

Executive Committee

If you weren't at the AGM you won't have heard that the Executive Committee (EC) has appointed a number of Consulting Members. These have the same rights as regular EC members but cannot vote on resolutions, become officers, or serve on the Finance and General Purposes or Remuneration Committees. They might be people who are unable to attend EC meetings regularly, often representing constituencies from which it is hard to draw full EC members and which would otherwise go unrepresented, or people who are waiting for a space to stand for election to the EC.

The current Consulting Members are: Professor Chris Hardacre, Chemistry School, Queen's University Belfast; Ms

Website Latest

For the latest information on CaSE activities, please go to the website which is updated regularly

www.sciencecampaign.org.uk

CaSE News

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Spoiled for Choice

Almost everyone agrees that this country needs more people who can speak to others in their own language. The government, however, refuses to make languages compulsory again, even though the change from "compulsory" to "an entitlement" has now cut the number taking modern languages GCSEs by approximately half.

They say they will rely on other measures, such as better language provision in primary schools. Starting earlier would certainly be an improvement, but we're not convinced it will solve the problem. In any case, the gains are uncertain and several years down the road, whereas the losses are real and now.

Students in most other countries are required to study a number of basic subjects at least to age 16 and often right up to the end of secondary education. Here, we are curiously reluctant to do that. Instead, we allow students to choose to study those subjects or not, and then, because we really think they should, we try to find ways of making them more "attractive" so they can compete with the growing number of alternatives on offer.

If you allow young people a choice of subjects, they won't necessarily choose the ones you'd like them to – or that in a few years time they'll wish they had chosen. That's what having a choice means. They will be tempted by the ones that sound the most interesting, or are what their friends are taking, or are just different from what they have been studying up to now. Even if they listen to careers advisors, the chances are that the advisors themselves do not know enough about scientific careers. And if you also make all subjects count equally towards targets and qualifications when some are actually easier than others – or

are perceived by the pupils or their schools to be easier whether they are or not – then what do you expect?

If we really want students to continue in certain subjects, then we should make those subjects compulsory. Other countries do that, and they don't find they have to chain students to their desks. If everybody studies their national language and mathematics and some other subjects as well, then that's what you do. It's only when you offer a choice that the problems start. You may improve things for a small minority who have a real issue with a subject, but at the cost of damaging the education of the majority.

This year, the Government announced plans to make it compulsory for young people to be in some form of education or training until they are 18. This policy may alleviate the serious skill shortages that Leitch and others have identified and also help more young people into satisfying and well paid careers. But it is hard to understand why a government which is prepared to act to keep young people in education and even act on what should be in school meals, is so tentative when it comes to what they should study while they are there.

As for making subjects more attractive, the best way to do that is not by fiddling with the curriculum but by having more well qualified and enthusiastic teachers. Everyone agrees that there aren't anywhere near enough of them in subjects like mathematics, physics and chemistry, but too many refuse to accept that this actually matters, that it is having a serious effect on the education of thousands of our young people, and that something has to be done about it – not in the distant future, but as a matter of urgency.



From the Human Genome Project to the development of anti-TNF therapy for people with severe rheumatoid arthritis or ongoing trials of an artificial pancreas for people with type 1 diabetes, the many success stories of health research in the UK over the past thirty years often reveal medical research charities

as an important if not pivotal source of funding and support.

In 2006/7 alone, the 113 member charities of the Association of Medical Research Charities (AMRC) spent approximately £791 million on medical research: one third of all public funding going into the system. The majority of this funding - 70% - goes to universities and last year, to single out just one of the avenues for this money, the sector supported almost 3,000 scientists at different stages in their careers. The scale and contribution of the charity sector to research in this country and around the world is unparalleled and a success story in its own right.

Thirty years ago the AMRC was little more than a loose network of chief executives from research charities who saw a need for the sector to have a common voice on key issues such as university funding. But they also recognised that the reputation of the sector would either flounder or prosper on the standards and probity of the mechanisms by which its members were seen to distribute their money.

So it is no accident that the AMRC has evolved over time to also become a mark of quality within the sector and a custodian of those standards. To be members of AMRC, charities have to demonstrate that they fulfil the Association's criteria on the use of independent external peer review when allocating funding, they must have a research strategy in place and they must support the Association's statements on the payment of indirect costs in universities and the use of animals in medical research. Charities share many of the concerns

The Key Role of Medical Charities

and challenges of other funders and indeed the wider research community: the increasing costs associated with an often complex regulatory environment; concerns over ensuring research integrity in an increasingly global environment and; worries over the supply of young scientists into the system that will sustain the UK as a leader over the next ten years and beyond.

And, like CaSE, we are also keen to understand the implications of Cooksey for the future management of health research. With the money and institutional framework now falling into place, our attention like others has turned to how the new Office for Strategic Co-ordination for Health Research (OSCHR) will approach its given task of setting research priorities that reflect both health needs and scientific opportunity. No mean feat.

As I have written elsewhere, the recent Government announcement on the single health research fund was a welcome signal of the Government's commitment to seeing through the Cooksey reforms and bolstering medical research.

But the anticipated announcement on the monies that would be available to universities through the Charity Research Support Fund (CRSF) was notable by its absence.

Established by the Government in 2004 under its 'Science and Innovation Framework' the Fund recognises that charities should not pay the indirect costs of research in universities and provides institutions with a stream of funding to cover a proportion of these costs.

If, as expected, the Government keeps to its original commitment of making available £270 million and no more by 2010-11, the Fund will not be sufficient to match the ambitions of charities for their research funding. And in such a tough economic framework it will be important that individual institutions and their representative bodies, together with AMRC and its members, ensure proper implementation of the Fund while

stressing the importance of the links between the two sectors in driving much of the research currently being conducted in the UK.

The second – and final – challenge for charities relates to the particular role they can play in both harnessing the patient voice on research issues but also in involving patients and the public (PPI) in their research more generally.

I do not hold with the view that the public are not engaged in science or science issues. Forty per cent of all donors give to medical research charities and 19 per cent of all public donations go to medical research. Any charity chief executive will tell you that fundraising on research is one of the strongest 'asks' one can make of the public because of their desire to be part of, and contribute to, the solution.

But there is an issue around 'public understanding' and this is where charities, particularly those that represent a distinct patient constituency, have an important role to play, as was demonstrated clearly during this year's debate on hybrid and chimera embryos. If and how their relationship with the public might be brought to bear on more generic issues such as the secondary uses of patient data is a key question for the future. As is the issue of identifying ways in which the public can be involved so that we are asking the right research questions of the greatest potential benefit and impact for patients. Last month, AMRC set up a project entitled 'Natural Ground' to explore the question of patient and public involvement with our member charities, to find ways of making this involvement happen that will benefit research – and patients as well.

This is an issue where charities – perhaps more than any other funders – have the strongest potential foothold and where their appetite for innovation, like their funding, can add value to health research in the future.

Simon Denegri, Chief Executive, AMRC

Review of Primary Education

The Primary Review, based at Cambridge University and supported by the Esmée Fairbairn Foundation, was set up about a year ago to find out how well the current system of primary education is doing and to make recommendations for the future. It is the biggest independent enquiry since the Plowden Report in 1967, so even though we haven't had much about primary education in CaSE News in the past, we've been following the progress of the Review with some interest.

While the full report is not due until next year, a number of interim reports have already appeared. The most recent, on standards and quality, has naturally caused a certain amount of controversy, including an encounter on the Today programme between one of the authors of the report, Peter Tymms of Durham University, and the Under Secretary of State for Schools and Learners, Lord Adonis.

In fact, the verdict on the primary schools' performance is reasonably encouraging. Standards in mathematics have risen, while those in reading and science compare well with many

other countries, although there is a much bigger gap between high and low attaining pupils than elsewhere.

The disagreement between Professor Tymms and the Minister arose because the report claims that the Literacy Strategy has not had anything like the effect that has been claimed for it. There was an apparently large improvement in performance between 1995 and 2000 but much of this is ascribed to defects in the national tests, rather than to real progress. On the whole, levels of literacy are about where they were in 1950. The Minister refused to accept this finding. The view of his Department remains that the national tests are so rigorously monitored by experts that they can be relied upon absolutely. Those who have watched the inexorable rise in A-level grades and seen no corresponding improvement in what students know or can do when they arrive at university tend to take a different view.

The report also commented on the negative effect of national testing on primary education. The tests cause stress in the children and they distort the curriculum because they lead to a narrow definition of what constitutes standards. The report urges a shift from summative to formative assessment (i.e. tests designed to enhance learning rather than merely to assess performance) and recommends that standards be monitored by sample surveys rather than national tests at Key Stages 1 and 2. This issue too will be familiar to those who teach at secondary level or in university.

Bologna

In previous issues of CaSE News we've mentioned that UK universities are going to have to find ways of fitting their Master's degrees, which are normally awarded after one year, into the Bologna second cycle, which requires two. We've now heard that many universities and accrediting bodies are planning how they propose to deal with this, either by making the courses longer or else by showing that the level already achieved by the students they admit makes one year sufficient.

This raises the question of whether it is necessary to award second cycle qualifications at all for programmes that are not meant as preparation for the third cycle, i.e. for a PhD. There are many postgraduate courses that are intended to prepare students not for further study but for a particular career. Some already lead to a diploma or certificate, but in others the award is a Master's degree.

There may be good academic reasons for lengthening such a course. Where there are not, however, then it would be better to give up the title Master's than to add an extra year. In the past, that might have made the course less attractive, but that

problem should disappear when few if any courses lead to a Master's degree after only one year.

This might, however, raise another problem. In the future, professional qualifications are going to be more and more EU-wide and the necessary academic background will be framed in terms of Bologna. They will almost certainly become essential in professions where at present they are not, at least in the UK. It will be much easier to get appropriate one year qualifications recognised for these if they are specifically acknowledged as part of the Bologna pattern, albeit not as qualifications for entry to the third cycle. Hopefully other countries would support such a proposal, as it would tend to reduce costs for them as well, both in university funding and also by not taking an unnecessary year out of a candidate's working life.

Whatever happens, a substantial number of courses are going to take a year longer than they do now, and this will have to be paid for. How much of the extra cost should be borne by the government and how much by the students will be a political decision, but the money will have to be found from somewhere. What the government must not do is sign up to a system that will require a lot more teaching without ensuring that the universities have the resources to do it.

Cutting Edge Collaborations

A one-day conference for delegates to learn from experts at the academic and industrial interface, February 1st 2008.

When companies engaged in R&D collaborate with science departments, the outcome can be mutually rewarding to both sides as well as to the economy and society at large, which benefits from a new scientific breakthrough.

Successful collaborations can far surpass the potential of one organisation working alone but they are not necessarily forged easily. They require foresight, commitment and trust as well as support in brokering partnerships and legal and financial advice.

There are instances when attempts to form collaborations break down, often due to misplaced expectations, for example over where the Intellectual Property ownership lies, or a lack of appropriate expertise in negotiations.

CaSE's has organised a one day conference to examine in detail the important issues surrounding academic and industrial partnerships.

The key-note speech will be given by Professor Martyn Poliakoff, EPSRC and Royal Academy of Engineering Fellow in Clean Technology, with talks from entrepreneurs Dr Robin Daniels, CEO Norwich Research Park, and Rod Dowler, Managing Director, Arlight Media Technology. Participants will also hear from both sides of the partnerships involved in the Centre for Materials Development (Professor Andy Cooper, University of Liverpool and Dr Miles Eddowes, Unilever) and The CARMAC project (Professor Robbie Burch, Queen's University Belfast, Dr Stan Golunski, Johnson Matthey). Delegate numbers are restricted to 45, so there will be ample opportunity for networking, questions, and discussion with some truly excellent pioneers.

CaSE members are entitled to a discount for this exciting event, which will be held at the Institution of Engineering and Technology, London. Booking forms are available via the CaSE homepage, www.sciencecampaign.org.uk, or from the CaSE office, tel: 020 7679 4994. Please send in completed forms by 5th December 2007, and we hope to see you on the day.

Incentives for Knowledge Transfer

Governments put a great deal of money into university science and engineering departments and, naturally enough, are anxious to see a return in the form of innovation. Certainly the Sainsbury Review (page 1) is very much concerned with knowledge transfer, with getting ideas out of university laboratories and into industry. So we were interested to see an article by Mark Schankerman of the LSE, describing work that he and colleagues have done to identify the incentives that help the process along.

They studied American universities because the necessary data for Europe are not available. They found, as you might expect, that financial reward to the inventor, whether as cash in hand or as support for research, is a major incentive. In many cases, the effect is so great that raising the proportion that inventors receive can actually increase the net revenue to the university.

They also found that private universities were more successful than public ones. There are a number of reasons why you might expect this to be the case; for example, public universities do not have the same freedom to pursue income maximisation as their chief aim. The most important difference, however, is that private universities are much more likely to adopt incentive pay for the staff in their technology licensing offices. Once the use of incentive pay was controlled for, whether the university was public or private had no independent effect on licensing performance.

Now you always have to be a bit careful about applying American experience to the UK. The two systems are not as similar as they appear to the casual observer; for one thing, we do not have the two quite different kinds of university, public and private. All the same, the results do indicate how important it is to have an active and enthusiastic office to deal with patents and knowledge transfer.

Schankerman also points out that generating patentable inventions is not the only function of a university. Incentives that are very effective at promoting this one activity, important though it is, may have undesirable consequences in other directions. This too has to be considered.

M. Schankerman. Harnessing Success: incentives for invention and technology transfer in universities. *CentrePiece*, 12 (2) Autumn 2007, pp2-5. Available at <http://cep.lse.ac.uk/pubs/download/cp230.pdf>

The supercritical Professor Poliakoff

Professor Martyn Poliakoff is about to be 60 and will be giving a special lecture about his life to his students and co-workers at Nottingham University to mark the occasion. He has a talent for explanation and will have no difficulty in summarizing the career of forty years which has been as important to the development of green chemistry in the UK as supercritical fluids (SCFs) have been to his work.

The most striking example of Poliakoff's powers of explanation, already well documented, is the analogy describing his vision for the future of green technology involving SCFs used in New Scientist article. SCFs are materials which, when heated, react differently from normal, allowing them to be used as solvents for industrial purposes. Water and carbon dioxide are the most common and being eco- and user-friendly, make SCFs an important new green technology. At the time, SCFs were already being used for the decaffeination of coffee and for new polymerization techniques and Poliakoff wanted to convey clearly and humourously the ease with which SCFs could be exploited in the future.

In the article, Professor Poliakoff described SCF chemistry, as being "as simple as operating a coffee vending machine". This caught the attention of Thomas Swan, the owner of the fine chemical manufacturer Thomas Swan and Co. Fired by the powerful analogy, Swan immediately comprehended the potential that SCFs had for his business. Contact was established between the two men, and so a chance reading of an article ultimately led to the building of a new, world-class supercritical specialty chemicals fluid reactor in County Durham, in 2001.

One of chemistry's greatest challenges is finding environmentally responsible ways to manufacture chemicals and products. Professor Poliakoff has excelled in this area, for example, collaborating

with chemists in Ethiopia and at Procter & Gamble to create plastic bags made from local sugar cane. He explains: "If you can do this, then Ethiopia doesn't have to import oil to make petroleum-based plastics, and when the bags are thrown on the ground the cows can just eat them."



This quote is another example of the way in which Poliakoff can effortlessly and succinctly convey the applications of his research. Sharing knowledge is something he is committed to, often through a personal connection. In the case of Ethiopia, a link was formed when his son was working as a physics teacher there and, during his holiday, Poliakoff senior paid a visit to the university. There is now a collaboration between the Universities of Nottingham and Addis Ababa.

Poliakoff is, he thinks, the first UK Professor to have been appointed as a visiting Professor at Moscow University. He is half Russian by birth; his father arrived here as a teenager with his family to escape from Russia in the aftermath of the revolution. In 1989 he went to Russia for a conference and this was the start of another productive relationship. He has also been working for the last nine years with the Institute of Chemistry in Beijing in the area of SCFs.

Martyn originally studied Natural Sciences at King's College, Cambridge. His first week there was hugely important to him as he met his wife to be, Janet, and his future Phd supervisor, Jim Turner. His future was set.

After graduating, he got a grant from King's College to support him during his PhD. A move to Newcastle followed and then to Nottingham University where he is now a research professor well known for his interest in promoting science – he was responsible for the appointment of the university's first science communicator - as well as green technologies. A Fellow of the Royal Society, he sits on two of its committees.

In the early part of his career, Professor Poliakoff studied intermediate molecules which are formed during a chemical reaction. He said: "There were not many people studying this abstruse area of chemistry and I had to be able to explain to non-specialists why the research was important, and this has been very useful to me for the rest of my working life."

This skill has certainly paid dividends and will continue to do so. When Martyn's students and co-workers gather for his 60th birthday lecture, they will be in for a riveting run through four decades and may well be able to see the apparatus which he built for his first experiments and which continues to occupy a place in his laboratory.

Caroline Holland

Professor Poliakoff is a member of the CaSE Advisory Council and we are delighted that he will be delivering the key-note speech at the CaSE conference on Cutting Edge Collaborations early next year – please see the article facing and our website, www.sciencecampaign.org.uk, for more details.

Science and Education



This year's CaSE Distinguished Lecture was given by David Willetts, the Conservative MP for Havant and shadow Secretary of State for Innovation, University and Skills.

Science for success, science for innovation, science for the economy - these are messages we are used to hearing. But in the CaSE annual Distinguished Lecture, co-hosted this year by the Wellcome Trust, David Willetts reminded his audience that science is far more than that; it is the cornerstone of our culture. Science has been inherent in our thought processes since the enlightenment. It pervades not only industry and academia but also philosophy, ethics and art. His lecture, in part a celebration of science and in part a practical call for action, looked at the education children and young people receive in science and maths and how this shapes their basic concepts, aspirations and futures.

Mr Willetts began by describing the value of science and its integral place in British society. He quoted a personal hero, the empiricist David Hume, who said 'The same age which produces great philosophers and politicians, renowned generals and poets, usually abounds with skilful weavers and ship-carpenters. We cannot reasonably expect that a piece of woollen cloth will be brought to perfection in a nation which is ignorant of astronomy, or where ethics are neglected.'

Science, Mr Willetts argued, is neither merely a money-making exercise nor a purely academic discipline. It is relevant

to all areas of society, as a basis for rational thought. A scientific education should be valued in its own right, whether or not it leads on to a scientific career. There is now a shortage of science students, and this affects both academia and business. University admissions for the core physical sciences and even biology have dropped, departments have closed, and science in schools is suffering.

Mr Willetts pointed out that we must increase not only the demand for students to take up sciences but also their ability to do so. He described visiting a summer school at Cambridge University at which A-level students were enthused by the possibility of studying engineering. When he talked to individual students, however, he too often found that their A-level choices could well make their new aspirations impossible.

Central to increasing children's ability to study science at higher level is improving their basic mathematical skills from an early age, as well as giving them a good grounding in individual sciences at GCSE. Currently 8 per cent of maths teachers have no post-16 maths qualification and a shocking 42 per cent of designated 'science specialist' schools do not offer separate science GCSEs.

Mr Willetts then outlined some specific suggestions for consideration. First, he observed that the eccentric mixes of A-level subjects preventing the young would-be engineers from studying at Cambridge shows a dearth of proper careers advice. The current focus on league tables encourages schools to push easier subjects onto their students to improve results. The country needs a comprehensive careers service that can inform students of the doors opened by science qualifications, as well as the financial benefits of possessing a science degree.

A second idea was to provide financial incentives for science students. Though refusing to comment on the relative difficulty of science and arts degrees, Mr Willetts pointed out that science courses were generally more time intensive, giving students less freedom to take on part-time work. Offering bonuses to science students could be looked on as levelling the playing field.

Another of Mr Willetts' proposed measures was to increase links between schools and universities, as in Newcastle where local schools can use university laboratories for practical classes. This offers students not just better facilities but also an increased awareness of the possibilities of university science. And because science is a fast changing subject, subject-oriented continuing professional development for teachers is especially important.

Mr Willetts also felt that the culture in schools discouraged the use of existing rewards for teachers. Few schools feel comfortable awarding performance-based pay or increasing salaries for shortage subjects. This contributes to the shortage of high-quality teachers. The 'Teach First' project encourages recent graduates to spend a few years teaching before moving on to other things; Mr Willetts suggested an additional scheme, jokingly entitled 'Teach Next', that would allow people further on in their careers to take time out to teach.

As his final suggestion, Mr Willetts restated one of CaSE's own goals: that all students should have the opportunity to take separate science GCSEs.

However, Mr Willetts said, to truly address the state of the nation's young scientists we must look even further back. He pointed to the research of Michael Shayer at Kings College London, who recently discovered a drop in the basic conceptual skills of 11-

◀ year-olds over the past 15 years. Why this has happened is not yet clear, but Shayer places the blame for it on our current screen-based culture.

Children learn through experiencing the real world – there are mathematical and scientific concepts inherent in kicking a ball, building a model or playing with sand or water. Children are no longer able to roam freely and discover the world for themselves. Middle class families might organise their children's time with tennis and music lessons, extra classes and clubs, but for working class children there is often little option but to spend their free time in front of the television.

Science, Mr Willetts concluded, is fundamentally tied up with our well being, not just as adults but as children.

Sarah Hyland

The Science Diploma

The government is in the process of rolling out the new Diplomas. The first five, to be taught from September next year, are: construction and the built environment, creative and media, engineering, information technology, and society, health and development. The Diplomas will have three levels: Level 1 - Foundation; Level 2 - Higher; Level 3 - Advanced. We wish them well, though we are concerned about what will happen when they are scaled up from the pilots. In particular, we think it will prove much harder than the organisers anticipate to find work placements for so many students, especially in areas of the country where there is only a limited choice of employers or should there be an economic downturn.

A leaflet issued a while ago by the Department for Education and Skills described the Diplomas as “new employer-designed qualifications” that will be available in 14 broad employment sectors. That was clear enough, and it was presumably the brief given to the people developing the Diplomas, but it made them essentially vocational qualifications, and this goes against the very strong feeling in some quarters that academic and vocational should be brought together within a single framework.

The government clearly shares this view and has expressed the hope that in the fullness of time the Diploma will become the “qualification of choice” for young people and A-levels will disappear. That cannot happen as long as all the Diplomas are linked directly to employment, so late last month, Ed Balls, the Secretary of State for Children Schools and Families, announced that there are to be three new Diplomas, in science, humanities and languages, introduced from 2011.

This abrupt change of policy was welcomed by those who see it as an important step in establishing parity of esteem between academic and vocational qualifications. We disagree, not because we are content with the low status of vocational training in the UK – on the contrary, we are very conscious of the problems this creates both for individuals and for the nation – but because we do not believe putting all qualifications into the same formal structure will do much to improve matters. It is far more important to have curricula and qualifications that suit the real needs of young people and make the best use of what are inevitably limited resources.

The Science Council, the organisation representing the learned societies and professional institutions in the UK, discussed the proposed Diploma in science at a meeting held earlier this month. They were clearly unenthusiastic. They felt there was insufficient evidence, especially from the employment sector, to indicate a need for a science Diploma. They considered that current provision at levels 1 and 2 provides sufficient choice and flexibility, and that it was too soon after the introduction of the new GCSE to be making more changes. It is also not clear how the level 3 Diploma will fit alongside A-levels, or whether it will provide the prerequisites for entry to specific degree programmes in science and engineering.

The universities too are cautious: when Universities UK say are they “pleased to be involved in ensuring that the new Diplomas provide an appropriate progression route to higher education” they are also saying that it is not yet clear how they will. The Russell Group universities will recognise the Diploma, but this means only that they will accept it as an alternative to two A-levels as a necessary condition for entry. It says

nothing about how candidates with the Diploma will fare in competition with those with three or more high A-level grades, or how well they will do if they are admitted. Past experience does not make us optimistic.

As CaSE Acting Director Hilary Leever stressed in a letter in the Times Educational Supplement, the introduction of Combined Science GCSE has led to many young people being excluded from the physical sciences, and Curriculum 2000 dealt to mathematics a totally unnecessary blow from which it is only just recovering. We do not yet know what will be the effect of 21st Century Science. It may be possible to design a science Diploma that will both fit into the framework and also be seen by students, employers and universities as a better qualification than A-level. But that's not been done yet, and what we do not need in science is yet another well meaning initiative that is rushed in before it has been properly thought through.

Inspiration on Hold

In the August issue of CaSE News, there was an article on Inspired, the project to turn the Science Museum's Swindon site, a 545 acre former airfield now housing its overflow collection, into a major attraction. At the time, it was one of six schemes that had been shortlisted for a £50 million grant from the Lottery Fund.

We have now heard that it has been eliminated from the competition and will not be one of the four finalists. Naturally we are very disappointed, especially because much of the focus of the museum is meant to be to inspire children to be interested in science.

Our contacts at the Science Museum assure us that they have not abandoned the idea and are exploring with their partners how they can make these world class collections more available to the public even without the Lottery support they were hoping for. We'll let you know about any new developments, or you can look on their website: www.sciencemuseum.org.uk/

CaSE opinion forum: Under-represented groups in SET

The latest CaSE Opinion Forum tackled the complex issues surrounding under-represented groups in science and engineering. Appropriately, the event was sponsored by the UK Resource Centre for Women in SET (UKRC). Speakers explained how a lack of access, support and self-belief discouraged individuals



Rt Hon Iain Duncan Smith, MP, speaking on social justice

from certain groups from progressing in science careers. This contributes to the UK's 'leaky pipeline': potential scientists drop out of STEM at various points, from primary school to postgraduate work and employment, leading to a shortage of active scientists. Improving the balance of the UK's workforce is not only morally right but will increase our capacity for innovation and economic success.

The groups focussed on at the forum were women, people with disabilities, certain ethnic minority groups and students from socially-disadvantaged backgrounds. The aim of the forum was to take a combined approach, using lessons learned from each group to generate policy suggestions for the others.

A range of speakers discussed the current position of under-represented groups. Annette Williams, Director of UKRC explained that getting more women to study science did not necessarily solve the problem of under-representation. In the biological sciences, for example, women typically drop out at post-graduate level. She described the hurdles faced by women later in their careers, especially if they take time out to have children.

Valerie Farrar gave a valuable insight into the barriers that disabled students face in science, and highlighted the so called 'invisible' disabilities such as mental health problems. She spoke of the need for openness, sensitivity and understanding, pointing out that good practice in these areas is beneficial to all students.

Dr Sean McWhinnie of the Royal Society of Chemistry gave an overview of his research into the representation of ethnic minority groups in chemistry and physics. Some ethnic minority groups, such as Indian and Chinese, are over-represented in certain scientific disciplines, possibly because of parental influence and culture. Other ethnic minority groups, such as black Caribbean and Pakistani, are under-represented, possibly because of other cultural pressures and social disadvantage. The different patterns of representation across scientific subjects serve to illustrate the complex interaction of factors affecting a scientific education and career.



Professor Ijeoma Uchegbu shares her experiences and insights

Professor Ijeoma Uchegbu, winner of the Department of Innovation, Universities and Skills' award for Women of Outstanding Achievement in SET, described her experiences as a black woman in pharmaceutical nanoscience.

Ijeoma, who calls herself a 'case-study' in under-representation, ascribes her success to an adolescence spent in Nigeria, surrounded by black role models. She spoke of the lack of such role models in British culture.

The keynote speech was delivered by Iain Duncan Smith, MP, founder of the Centre for Social Justice, who spoke passionately about his work to benefit socially disadvantaged children, focusing on the importance of family, and the need to start assisting children in the first three years of their lives.

The forum ended with a long discussion: equality and diversity experts and members of a variety of academic institutions, companies and non-profit organisations pooled their knowledge to generate new policies to redress the balance in SET. Several suggestions were put forward, including the creation of a diverse network of scientists across all areas of under-representation to serve both as mutual support and as positive role models in schools.

CaSE Opinion Forums offer members of the scientific community an opportunity to increase their awareness of key issues, and allow CaSE to take on board a range of positions and innovative ideas to put to the government. The issues and ideas raised in this latest forum will appear in a policy document to be published early next year.

Sarah Hyland



Lively discussion of factors affecting scientists with disabilities in one of the break-out groups

CaSE's New Membership Officer



Our new Membership Officer, David Hawksett, introduces himself to our members.

It's been just over a month since I started as CaSE's new Membership Officer. So far it has been excellent – the office is small and the lack of bureaucracy means that we are

able to respond quickly, but have to work hard to do so. Working with Hilary, Susan and Sarah has been great so far.

About me: it was the Young Astronomer's Handbook by Patrick Moore that first got me going when I was around seven. Astronomy was always my first passion and still is. I went on to study it for a degree before embarking on a PhD that didn't turn out as planned. Quite soon after starting my doctorate I quickly became distracted by all the 'other stuff': the networking, organising meetings, outreach and media relations. Then I was effectively poached by the BBC to work on a flagship science series for BBC2, which led on to other various science assignments for 'auntie'. Those experiences were thoroughly enjoyable and gave me valuable insights into the seedy worlds of television and media in general!

Then I was fortunate to spend five years as the science and technology editor of the Guinness Book of Records. That was a great opportunity for me to push interesting sci/tech achievement stories out to the millions of readers that the publication has around the world. I was able to meet many of my heroes in that job and witness some pretty amazing things. For example it was a privilege to adjudicate on the first successful space flight by SpaceShipOne, built by the legendary engineer Burt Rutan, back in 2004. The atmosphere felt like a cross between Woodstock and Kitty Hawk when the Wright brothers first flew, and the event happened just down the road from where Chuck Yeager first broke the sound barrier. The Guinness work was challenging and fun and I learned a lot about academic-media relations. I still work for them now on a freelance consultancy basis.

My other main freelance commitment these days is outreach. For the last couple of years I have been writing and presenting material to schools for a company called Starchaser – one of the private companies aiming to sell tickets to amateur astronauts for a trip into space. Starchaser are small and friendly but are major players in their field – kind of like CaSE. They also have one of the best outreach programmes in the country. We take their biggest

rocket, the Nova, to schools on the back of a lorry. Nova flew from Morecambe Bay in 2001 and is designed to reach about half way to space with a manned capsule. Seeing the reactions of all those kids when that 50-foot high genuine rocket is hoisted into launch position in their playground is amazing. For me it is all the proof I need that kids in schools would love to learn more science and engineering if the right resources were made available to the schools – particularly more specialised science teachers.

Joining CaSE at the end of September was good timing. I was very quickly able to attend my first Opinion Forum on under-represented groups. That was a terrific meeting with a real can-do feeling about it. Hot on the heels of that came the AGM, accompanied by the Executive Committee meeting and Annual Distinguished Lecture – an extremely energetic and fulfilling day!

I think my main impression so far is that CaSE, despite its long and distinguished history, would still gain from increasing the extent and breadth of its membership to make sure it is representing the critical views of the community and to speak with wider authority. I am looking forward to recruiting new members and continuing to work with our current members so that, between all of us, we continue to make a real difference to the health of science and engineering in this country.

CaSE Monthly Update

If you would like to receive a monthly email updating you on CaSE's activities and comments on policy news then please contact susan@sciencecampaign.org.uk

Plumbers

A little while ago we were chatting with a Polish politician, and we asked him if it was true that many people in his country, as in ours, are not entirely reconciled to membership of the EU. He said that this was so, and added that in his opinion it only showed they weren't taking fully into account the benefits of having joined. In the past, for example, many of his constituents came to him hoping he could help them find work. That doesn't happen any more; now there are skills shortages, especially in the building trades.

We offered to tell him where all his plumbers have gone, but of course he already knew. Fortunately, it turns out that Polish builders are able to hire Ukrainians. As these countries become more prosperous, we'll have to train more of our own.

Continued from front cover

- Agencies, the Research Councils, government departments and economic regulators to coordinate public sector technological innovation, leverage public sector resources and simplify access to funds for business. It should extend into new areas, such as the service sector and creative industries and it should develop an international strategy.
- The UK should strengthen its knowledge transfer performance. The Research Councils should have firm knowledge transfer targets. The number of Knowledge Transfer Partnerships (KTPs) should be doubled and they should be made easier for small and medium size enterprises (SMEs) to access. They should also be extended to Further Education colleges.
 - Measures should be taken to facilitate the dissemination of knowledge to those who can make use of it.
 - More assistance should be provided for early-stage high-technology companies
 - There must be a major campaign to enhance the teaching of science, technology, engineering and mathematics. This will involve raising the number of qualified teachers and measures to increase the number of young people studying separate sciences and the new second mathematics at GCSE. There is a major need to improve the level of career advice.
 - Government departments must do more to stimulate innovation in the companies with which they interact.
 - The Regional Development Agencies should devote more resources to four specific areas: TSB programmes, KTPs between universities and businesses, high-technology clusters around universities, and support for proof-of-concept schemes.
 - International collaboration should be a core part of the strategy.

These are all rather broad statements, but the review is some 175 pages long and contains many detailed comments on a wide range of specific issues. To pick one at random, there is a discussion of how we can ensure an adequate level of innovation in the water and sewerage industry. This draws on a report from

UKIWR, the industry body that conducts research of common interest within the sector, and which noted that innovation tends to be restricted to areas covered by regulation, leakage and water quality, rather than other issues such as energy efficiency. It raises the question of whether regulation or competition is the best way forward.

There are similar discussions of many other topics, and if you are working in science or engineering, it would be worth having a look at the Review. There's still some way to go before any of the points that are made are translated into firm policies, but it will give you an early indication of how things may develop over the next few years.

The Race to the Top: A Review of Government's Science and Innovation Policies (ISBN 13-978-1-84532-356) was published on 5 October, 2007 and is available at <http://www.hm-treasury.gov.uk/media/5/E/sainsbury_review051007.pdf>

Excellence with Impact

On the same day that the Comprehensive Spending Review appeared, Research Councils UK (RCUK) published *Excellence with Impact*, a report on maximising the economic impact of research. This follows on from the Warry report in 2006 and an RCUK document earlier this year. It documents the impressive impact of selected research council projects and lays out a plan that will require grant applicants to describe the economic impact of their work. This factor will be taken into account in funding decisions, to be made by panels that will include non-academic end-users of the research. This proposal is consistent with the Sainsbury Review recommendation that the Research Councils should agree and be measured against knowledge transfer targets.

While it is both interesting and important to look back at the economic impact of a specific piece of research, we can seldom say in advance what long-term economic impact the research might yield. It is reasonable to ask the Research Councils to justify the money they have spent. But future research should not be allocated

by end-users on the basis of predicted economic benefits because it is so hard to estimate what these might be. RCUK's Professor Esler admits of previous funding that "Many of the impacts were not necessarily part of the rationale for the specific investment."

The proposals also fail to recognise that project funds are frequently diverted to other research, for instance, because of rapid changes in research development or because a project pays off unexpectedly quickly. Professor Esler also suggests that concerns about using economic impact to guide funding decisions are unfounded as a broad definition of economic impact is used that includes, for example, improving the quality of life or government policy. This misses the point – these gains are still unpredictable.

Some time ago we published two articles by people with direct experience of funding major research programmes. One was Susan Cozzens, who was at the time Director of the Office of Policy Support at the US National Science Foundation, and the other was the late Roger Needham, then the director of Microsoft's Cambridge Laboratory. Both advised against trying to manage research in the way that is being proposed. Even if economic impact is one of your major aims, you should pick the best scientists and engineers you can find, tell them the general areas you are interested in, and let them get on with it. An important part of being a good researcher, after all, is being able to select the problems that are likely to lead to interesting results. And it's from interesting results that innovation is likely to come, almost by definition.

The Research Councils' proposal that academics justify their work in economic terms should alarm all who believe in the Haldane principle under which the councils were founded. This states that Research Councils should allocate funding without political interference. There are, or should be, other sources of money for goals set directly by government or business. What the government is seeking to do, in effect, is to control research paid for by the Research Councils to make up for the reduction in research paid for by other departments. We cannot afford to be complacent about the funding and control of science in the UK.