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BIOSCIENCES FEDERATION

JOINT MEETING : 9 NOVEMBER 2005
At the Royal Institution of Great Britain

Government Science Policy and an RAE Update

Chairman **:** Peter Raymond MBE
Speakers:
Professor Sir Richard Sykes (Vice Chancellor, Imperial College, London)
Dr. Ian Gibson (Select Committee for Science & Technology)
Professor Sir Alan Wilson (Director General of Higher Education)
Stephen O'Brien MP, Shadow Minister for Skills & Higher Education

Chairman : Professor Peter Heathcote, Queen Mary, London

Professor David Finnegan (Chair, sub-panel 14: Biological Sciences)
Professor Sir John Beringer (Chair, panel D: Biological, Food & Agricultural subjects)
Professor Sir Leszek Borysiewicz (Chair, panel A: Medical and Clinical Subjects)

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The Government's Science Policy

Professor Sir Richard Sykes, Vice Chancellor, Imperial College, London

Bioscience is an area the UK can really compete in, and the government recognises this. The main reference point for this is the 10-year Science and Innovation Investment Framework, and for the first time the government is funding universities as if it truly believes that science can drive the economy. There are some questions, however, around the areas of the FEC, the teaching shortfall, and the supply of the next generation of bioscientists.

The FEC

The government accepts that publicly-funded research should cover its full costs, and the FEC will improve funding for university infrastructures and will move universities towards financial sustainability. The current position is that subsidies are provided by the next generation of researchers: they will have to find resources to replace the worn-out assets used by today's researchers. The FEC will instigate a move to a 'pay as you go' system that delivers investment funding now to replace those assets.

There are a number of challenges for research providers. We need to consider what effect FEC will have on the research we take on; and our relationships with industry, with the EU and ERC, and with charities will all come under greater scrutiny. We will have better information on which to base choices about the research we should be doing and about how we should spend the additional funding that should result: this means spending on staff as well as facilities; it means making informed choices about where to cut back as well as where to spend. It will encourage us to become more explicit about what goes into the research portfolio, and while not automatically cutting back on research that we value for academic and social reasons, we need to be aware that if it does not pay for itself the funding still has to come from somewhere.

A big adjustment is required not only of universities, but also funders both public and private. There has not been a universal acceptance of change - and to date the government has not been a strong advocate of the benefits of the very change it is requiring universities to make. Theoretically, government departments are supposed to pay 100% FEC, but instead they are stating a sum available and asking what can be done for that amount. Further, industry has also reacted strongly to FEC, with many refusing to pay the higher costs; the government must, therefore, ensure that, having required the change, it provides enough funding through its own funders. It must also recognise the value of research that does not pay 100% FEC, a strong argument for general support even as we shift to a 'user pays' principle.

There are two challenges to the government:

- Will we still be doing the same amount of research in five years' time as we are now?
- If SRIF ends, there should be no bail-outs for those who have not put aside for their infrastructure.

The advent of FEC is clearly good for the HE sector, but we have to learn to manage it in conjunction with our funders rather than let it drive and determine our activity.

Teaching Shortfalls

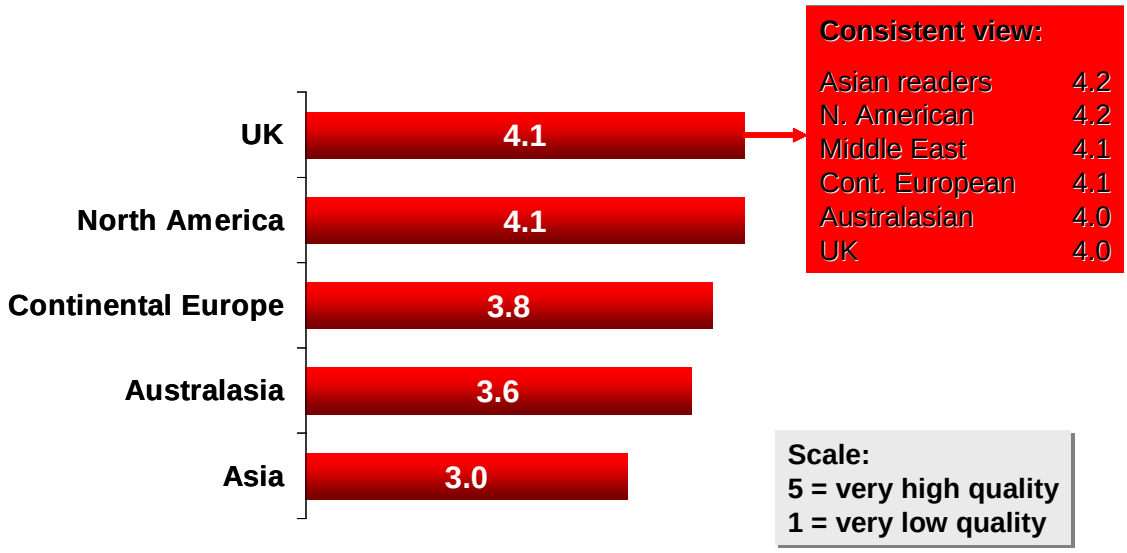
Sir Richard cited Imperial College as an example of teaching shortfalls: based on 2004.2005 estimates, even after top-up fees the college will be left with an estimated loss of £14.7M on teaching undergraduate lab-based students. Such deficits have a number of projected consequences:

- Difficulty in recruiting and retaining both students and staff.
- Deteriorating teaching infrastructure
- A possible fall in standards?
- Possible financial dependence on the international student market
- Greater difficulty in achieving and maintaining global competitiveness

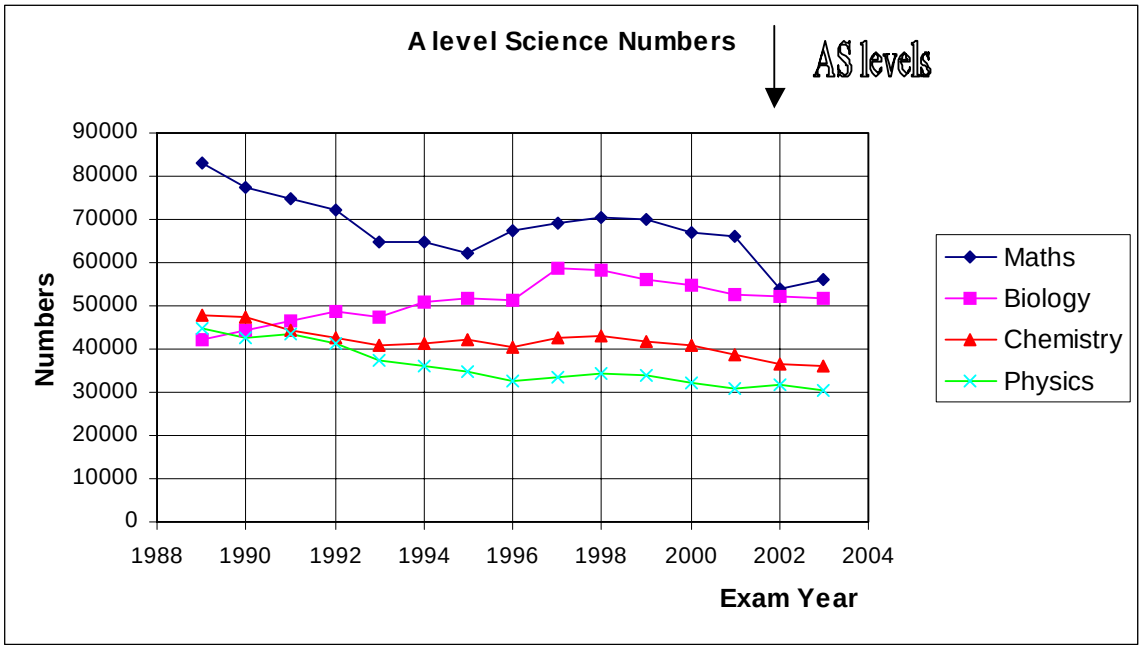
It costs as much - or more - to stretch the most intellectually gifted as it does to bring up those who had a poor educational background, and for all the effort and resources expended on the latter we fail to recognise the former; yet many of the former will be leaders of industry and the professions. Sir Richard put forward the argument that we need to pay for premium places, for premium courses, to train these leaders: we recognise and stream the most gifted and talented in schools, and it is time this was done in universities as well.

The Next Generation of Bioscientists

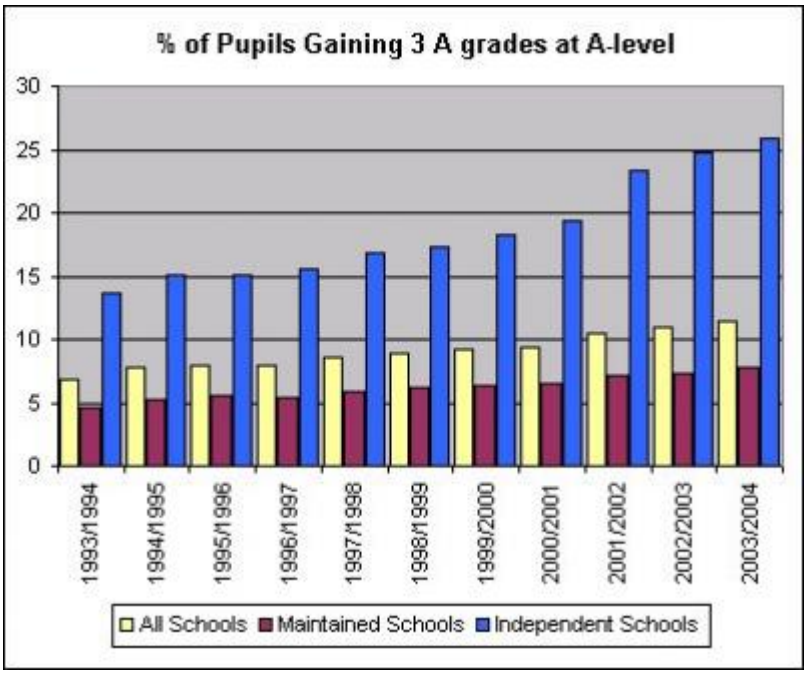
A recent *Economist* survey offers some positive encouragement for us in the UK:



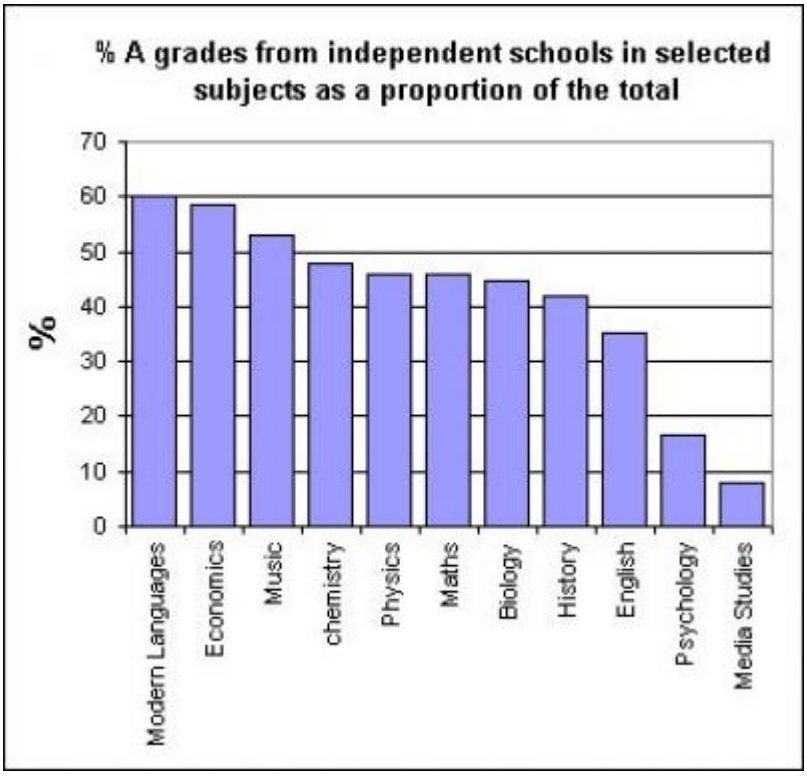
Amongst *Economist* readers we are the most highly rated region in the world for universities, alongside North America. Next to this, however, there is a worrying decline in interest in science subjects:



Here we see a disparity in the science literacy of young people across the world, and there may be a hint that the older economies are losing important intellectual resources, with the rapidly emerging economies engendering better the necessary thirst for scientific knowledge. In England and Scotland, we again do well, coming out above the international average, but having looked at science literacy at age 14, if you look at the trends coming through at 18 there is the familiar long-term decline in numbers taking science subjects. There is also a widening distinction between independent schools and state schools, with some 25% of students from independent schools achieving 3 A grades, compared to just 7% from the state sector.



In Chemistry, Physics and Biology, between 45% and 48% of A grades are coming out of the independent sector, which comprises just 15% of pupils.



All of the above is worrying even with the assumption that an A grade is worth the same as it was a decade ago, because we all require students with the top A-Level grades from these increasingly rare subjects; and no matter what we want to do in terms of widening participation and access, these students are primarily to be found in the independent schools. We must, as the Biosciences Federation will recognise, take every chance and opportunity that presents itself to improve this situation.

Science and the current political agenda Politics: Science's unconquered frontier

Dr Ian Gibson MP

Powerpoint Presentation

In July 2004 the government launched a ten-year Science and Innovation Investment Strategy. Government funding for science is to rise from £3.9 billion to £5 billion by 2008; this represents a doubling of cash spending since 1997. The Wellcome Trust is matching the government commitment by investing at least £1.5 billion in UK research over 5 years. Spending on public and private R&D is to rise from 1.9% of GDP to 2.5% by 2014 - this will put UK at top of European spending league and much closer to the U.S.

The 10 year plan: what the government is asking of science and of itself:
Research excellence
Greater responsiveness to the needs of the economy
Increased business investment and engagement

A strong supply of scientists, engineers and technologists
Public engagement with scientific research and its innovative applications

To look in a little more detail at the need for a strong supply of scientists, engineers and technologists, current indicators are:
Education: there are signs that interest in STEM subjects is increasing
Recruitment of science teachers improving but not at a fast enough rate to make a real net improvement
Number of A level entries in 'core' sciences continues to decline
Implementation of training bursaries and Golden Hellos to attract more science teachers good idea but not radical enough considering the scale of the problem

Science Education: the problems

A Mori poll commissioned by Govt in autumn 2004 looked at public engagement with scientific research and its innovative applications:
80% of adults agree that science makes a good contribution to our society
65% believed that scientists told the truth
67% believed that scientists should listen more to 'ordinary people'
64% believed that the Media sensationalises science stories.
Govt has promised to support informed public debate on controversial issues such as stem cell research and nanotechnology

More Public engagement with scientific research and its innovative applications
Greater public engagement is another government aspiration, but is science up for the challenge? The key issues:
Democratisation of science is needed
The top-down approach to engaging with the public must go
Better media coverage
Scientists have to learn how 'to do politics'

How to do politics

Scientists are somewhat engaged with the 'obvious' political debates on science and public policy:
Climate change
Stem cell research
Animal rights

Scientists need to be less passive and engaged with the less 'obvious', engaging with such issues as:
Terrorism and the debate over the viability of biometric technology
The use of 'evidence base' policy in government policy making
The use of science in international development policy

The Government's Science Policy

Professor Sir Alan Wilson, Director General for Higher Education

Powerpoint presentation

The Government is committed to increasing student numbers (50% target) and to widening access with variable fees and bursaries. Although Bologna has been viewed as threat, forcing longer courses, attitudes are changing. British Universities are leading the way with the RAE, but also in a number of other areas: quality of output for shorter courses.

Student numbers

The government is committed to maximising growth in the sciences and to building a world class system. Recruitment of students in the biosciences is driven by the quality of research.
CPD, LLL – employer engagement
Licensing, spin-outs
Regional development: supporting the RES, RSS, RSP
Foundation degrees – e.g. for technicians

The Science and Innovation Framework

The ten-year framework is designed to give:
A commitment to world-class research
Greater responsiveness of the publicly-funded research base to the economy and public services
Increased business investment and engagement (this has bearings on the FEC issue)
A strong supply of scientists, engineers and technologists
Sustainable and financially robust universities and public laboratories
Increased public confidence and awareness

Interdisciplinary Development

Interestingly it may become increasingly difficult to recruit in the biosciences as molecular biology needs mathematics, physics and chemistry (a similar situation can be found across many disciplines, e.g.: engineers need many basic sciences, and design skills; transport engineers needs mathematical methods developed in physics).

Interdisciplinary development is incredibly important. As soon as you look at different kinds of sciences and how they relate, there is an interdisciplinary imperative. This can get into very complicated territory: if teaching and training is too interdisciplinary there is a danger of merely providing breadth and not depth.

Curriculum challenges are important to consider:
Academic versus vocational (although this is less of a problem for the biosciences)
How we develop curricula to meet increasing demand for the strategic subjects is a challenge
Switch to GCSE ‘double science’ versus specialist disciplines? Is this be
Universities should have a greater responsibility over A-level curriculum in relation to what is required at the university level

The challenges in the Bioscience Federation report **Building on Success:**
The B F headings: seem to be mostly funding-related
Units of resource
Research overheads under FEC
Purposes of QR and HEIF
Recruitment and retention of staff
Inadequate support for RC responsive mode; and for young researchers
But also supply of STEM students – biosciences within STEM

The government should continue in the general direction set out in the 10-year framework. Funding must not be cut back since the UK is still only 6th among G8 nations in science spending as a proportion of GDP. The government remains committed to the framework. Its long-term ambition is for public and private investment in R&D to reach 2.5% of GDP by 2014. Funding for the UK science base over the 2004 Spending Review period (2004-05 to 2007-08) will rise at an average annual rate of 5.8% in real terms. The intention is that investment in the public science base will increase at least in line with the trend growth rate of the economy through the ten-year period, increasing science spending as a proportion of GDP.

Graduates leave most universities with insufficient practical training for R&D careers. This training could however be argued to be a curriculum issue (i.e. universities' responsibility). The HEFCE is conscious that the underlying problem is that all teaching is under-funded; but within a constrained funding envelope, we cannot simply alter weightings.

We can seek to protect the unit of resource for teaching in the forthcoming Spending Review. Capital funding through SRIF and HEFCE teaching capital is a major advance, as are variable fees. The lack of clear mechanisms for meeting research overheads under FEC could lead to a decrease in research volume. It is essential not to price-out industrial collaborative research, nor to make Britain's European Union grant applications non-competitive. HEIs can undertake commissioned research funded at less than FEC, to the extent that they are able to support this from other funding available to them; and in particular to use funding council (QR) research grant as support. There is the new charities support element within QR to be introduced from 2006-07. We will review QR in the future and seek to clarify its role
There is uncertainty as to the ability to recover full economic costs of research carried out, depending on the nature of the funder. The aim of the Government and HEFCE is that HEIs should over time achieve a better balance between the cost of all of their research (and teaching and other activities) and the funding *from all sources* that supports this. Working with OST, we are supporting this.

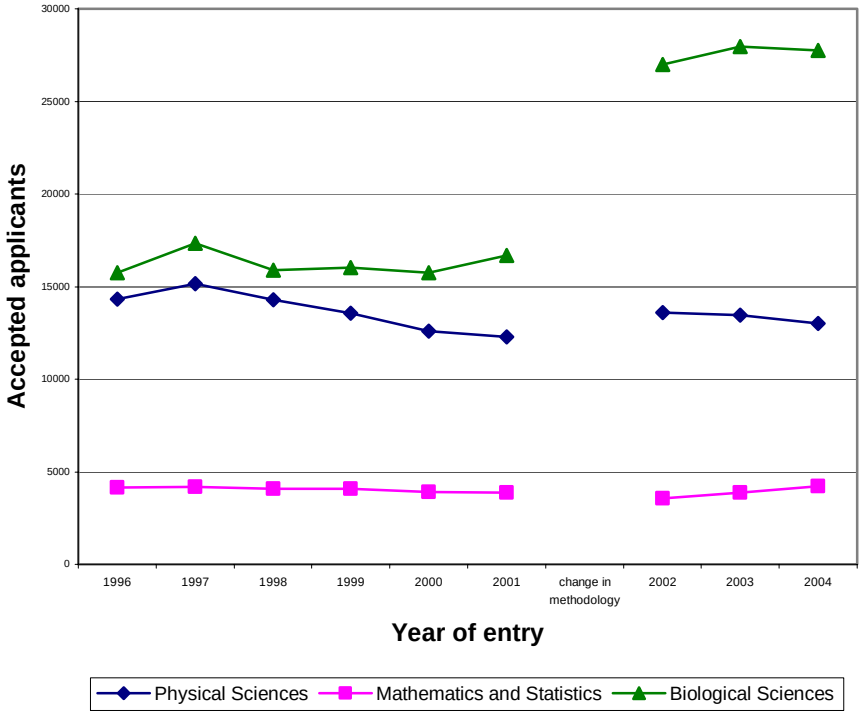
To review QR:

There is an increased oversight of some funding decisions, such as OST allocating a larger tranche of the science budget, and some of the money to the Research Councils being ring-fenced for specified initiatives, which is reducing the sums available for responsive-mode funding and restricting freedom of inquiry. Although overall we don't think that there is significantly increased centralisation: The bulk of the Science Budget money is passed across to Research Councils in accordance with agreed operating plans produced by the Councils. Very little Research Council funding is specifically ring-fenced, and in most cases this relates to additional funding obtained from Treasury in the periodic Spending Reviews.

STEM- support system

There are a large number of STEM initiatives designed to ensure a good supply of scientists from schools into universities. Certainly some are working as there are some increases in A-level science and undergraduate admissions, but it is not always clear specifically which these are. Many of these initiatives are new and there has not yet been time to evaluate them.

UCAS entry into undergraduate courses is a little more difficult to assess as there was a technical change which has lead to a break in the graph:



The worrying part of the graph is the bioscience data showing a particular downturn round the top. This is why we need all of HUBS to engage with the STEM agenda. As biosciences start to appear more difficult in terms of their connections to mathematics, physics and chemistry, they might suffer in the same way as physics and chemistry.

There are a number of DfES/OST STEM initiatives:
teacher recruitment and support
improved salaries for science teachers
increased teacher training bursaries
golden hellos
attracting more women into science.
(These initiatives do seem to be working but we have a long way to go).
CPD
the National Science Teaching Centre, and regional centres
Senior Maths Advisers
TDA commitments.

The challenge of the program is to provide good STEM support in all schools: we need to ensure that schools and colleges have access to a “STEM support centre” that would help them with their planning. Naturally the science learning centres lend themselves to being the core of this. We need to allow schools to be guided through the range of initiatives that are available to them and for funders to more effectively coordinate their funding.

Universities and STEM

Universities have a tremendous role in terms of specialised mentoring schemes: we need more schemes such as that of Imperial-Leeds (GSK, Rothschild) getting PhD and postdoctoral students into schools as teachers.

Concluding comments

The ten-year framework commits the Government to the support of science
There is a commitment to supporting the research base: full economic costs
But there is also a need to establish a thriving STEM base
This will come from coordinated STEM initiatives in schools and colleges, supported by universities and professionals and learned societies
And there are significant challenges to be met by universities, who are not passive partners in this enterprise – e.g. on future curricula developments, on interdisciplinarity; and on supporting the STEM base.

The Government's Science Policy

Stephen O'Brien MP, Shadow Minister for Skills & Higher Education

Mr O'Brien acknowledged that the Government has done pretty well in the field of science and technology (and biosciences in particular) and that it recognises the importance of bioscience research and development and have begun to fund and legislate accordingly. He has, however, concerns about the true role of the government in today's competitive and challenging global economy, regarding some of the things going on at the DTI as highly questionable; and feels there is a need to look at ways of removing some of the overhead costs of unnecessary government interference, ways to commit to increased funding of all the sciences, research and development budgets, research councils, etc.

The key issues are deregulation and a stronger education system. The quality of our school leavers and graduates is as important to the economy as tax reduction. The Conservatives are working on an holistic package which recognises that long-term economic strength comes from joined-up policy which supports the individual, the idea and the company throughout their lifetime by reducing levels of bureaucracy, by raising aspirations and through provision of quality public services in education and training and across the board. It is vital to bind together formal education, investment in the wider skills base of the individual, and the world of work.

Mr O'Brien noted the importance of quality careers advice from a young age and throughout working life and of increasing the profile of vocational routes into the biosciences, and the place of business investors in R&D at generating industry pull to R&D and training.

The current Connexions careers advice initiative focuses attention on those in economically deprived categories, giving little support to most young people; and there is a reverse snobbery amongst some policy makers who view careers advice for essentially employable young people as an indulgence. Biological Sciences as a whole has not yet lost student numbers but there is mounting evidence of course choice shifting away from molecular bioscience to such newly-fashionable subjects as psychology, sports science and forensic science.

It is very important for the west to see how we can support science in developing countries (e.g. in the fight against malaria). Despite recent high-profile campaigns and appeals (e.g. Make Trade Fair, the tsunami appeal) many of the problems faced around the world continue to be tackled by slow and methodical work done in laboratories. Making that connection for young people will give them that vision. Young people's aspirations will come from a wide range of sources: television, the work and aspirations of their parents and other adults, "the giants of their generation" and above all their teachers at school. An independent and universal advice and guidance centre could show young people the way to match their aptitude with their abilities. This is supported by vocational education, and high quality information services will go

some way to remedy the disparity that currently exists between our academic and vocational education systems.

Young people on vocational routes may suffer from low aspirations and assume they are incapable of working in a laboratory. Similar hurdles might exist for those who have left school with few qualifications and who now have the opportunity to return to training or those who have skills and have been out of work for some time. Advice and guidance could help them realise their skills and potential, and the emphasis on this is a framework which the government has to sponsor to get people to be enthused about the futures they can take.

The future of the biosciences in this country lies in fostering a close relationship between the education sector and business. We must make investment in R&D economically attractive to companies and to provide a stable climate for them to work in. There is a major structural problem in this country when it comes to the government's agenda about regional development: we cannot afford, for example, to have two world class nanotechnology centres, and yet we are currently going down a route which does not choose between various IVAs and thus dissipates our potential competitive advantages.

Opportunities for universities, science and business are often found in spin outs from universities, and these suggest positive career decisions having been made that marry individuals' interests with career-building and a way out of institutional environments. But spin out companies too often fail. They suffer from two problems: they are often far more product- than brand-based, and need to build a value behind a brand not just to deliver on product. There must be a real commitment to marketing as well as the technical components of the business. In Universities, the appreciation of true business risk comes after the risk as been taken, and this is deeply dangerous and actually very poor for UK plc.

The Government's Science Policy

Q & A

Panel:
Professor Sir Richard Sykes (Vice Chancellor, Imperial College, London)
Dr. Ian Gibson (Select Committee for Science & Technology)
Professor Sir Alan Wilson (Director General of Higher Education)
Stephen O'Brien MP, Shadow Minister for Skills & Higher Education

Q When things like FEC or widening access have some untoward downsizing how can we get the people in government to modify these initiatives or to admit that they haven't got them 100% right?

A There are MPs that will listen, keep trying! Modification will normally mean that somewhere along the line a politician is worried that they may have to admit to being wrong. By you being engaged in the way it is going through, at least you can make sure that the problems that you are worried about go forward and are put on the record so no government can say it was an unintended consequence.

A It is very important to use the political channels available. You said you have never seen an example of where things changing: the announcement that was made a couple of weeks ago on support of sport science students was actually an acknowledgement of a problem that

existed, then a delivery of something quite substantive to improve that situation. We are all ears on FEC, we realise that it is early days**.**

Q Next year all students will be paying £3000, profit from English will be even greater and the sciences' losses even more so. One way of dealing with that would be to recognise the elevated costs of running science degrees and increase the differential between English and science from 1.7 to say 2: is there any chance anything like that would happen? Is there any chance that science can be promoted in that way?

A There is an HEFCE funding review that includes a section on "fee assumption" which essentially deals with that. If you believe that, write into the consultations and support it. Those £3000 fees were not necessarily meant to go directly to the subject units.

A It is a fact that HEFCE are trying to deal with but we come back to the issue, we have got to have track methodology for teaching, understand what it costs because nobody will do anything until there are facts on the table and that is what we have done with research and we have to do the same thing for teaching.

Response from the floor re fees issue: if you are a business and you are going to get 15K out of which scientists will cost you 12K and you are going to have recruitment problems, which university running as a business isn't going to plan to run down its science and engineering over the next five years? If it is going to be left that all universities are going to be autonomous and the government has created a financial framework you will automatically lose your science and engineering because it is costing you more.

R There is no question that more chemistry departments will close in the UK. It has to as it is just so expensive to run something like chemistry. It will happen and also to some of the heavy engineering, some of these areas are going to disappear.

Q In relation to the first question, the biosciences has a very real problem in that they do not have a single organisation representing them. I want to be represented by one body such as the BSF, as a community we have to make that work. The government want to talk to one voice; they do not actually want to talk to twenty.

Q I find it bizarre that science students will have been all the way through the education system until they are nineteen or twenty and have absolutely no understanding of what a patent is, what innovation is, what a discovery is. I go to schools and talk to students about coming into science and the first question they ask me is how much money I earn!

A There is little understanding of patents. The government said in a review committee that there was insufficient interest in this topic, but you are absolutely right it is a key ingredient. In the USA everybody is aware of intellectual property.

RAE subpanels have met and drawn up the first draft of the “criteria and working methods”, the ground rules that the sub panels will use when assessing working in the future and which will guide people in assembling their submissions to the RAE. The principal aim of main panel D is to make things as uniform as possible within and between the subpanels (although there are still some subject-specific differences). Draft criteria went out for consultation during summer. Forty responses were received during the consultation, including 28 from HEI, about 1/3 of the number of submissions that there were in 2001. The main panels and the subpanels have been looking at the comments that were submitted. We have revised the criteria and working methods within the subpanels. The final criteria and working methods will come out in January.

Issues of concern to people were:

The RAE professes that the panels and subpanels are charged with assessing research activity and not assessing individuals, a distinction that has been difficult for some to grasp. There are going to be profiles with the output of the assessment and not boxes. Assessment of research activity will be made using three different indicators: output, environment and esteem. The main emphasis in all panels but particularly in the sub-panel is on output. One concern, in the draft criteria and working methods, was that we would look at some output in more detail and other in less. It has been agreed that we will look at everything equally and to the extent that is necessary to make an assessment.
Panel D and its sub-panels had only given an indication of what was expected of four star for output and not what would be the distinguishing characteristics of one, two and three star output. The main panel chairs discussed this, and for all sub-panels there should be a general descriptor for all star categories.
The issues of multi-author papers and multi-disciplinary work were both of great concern. Multi-disciplinary work is encouraged and we expect to see it.

RAE2008

Professor Professor Sir John Beringer, *Chair, panel D*

Main panels are there to cross-check that the sub-panels in their own area are operating properly and at the same level. It is very important for the main panel chairmen to ensure that material is getting cross-checked. If there is something that is out with the subject area of the panel it is essential that these are properly judged by those that have the skills to do so.

Regarding output from new members of staff: in the meeting we had with the sub-panel chairman we were completely in agreement as were the external members of the panel who were present, that in our subject areas under panel D the expectation is that new members of staff will have poor output. We are not expecting in the biological sciences areas that you are making submissions with people with fewer than four outputs, unless there is something extra special about those individuals. In which case you use your RA 5b. Our basic assumptions is that people’s output is four and upwards. RA 5b is very important; we cannot over stress the importance in this assessment exercise of being very clear about why individuals may not have been able to produce the expected amounts of output.

We do believe there should be a recovery period. If someone is off due to illness for a long period they cannot be expected to be running flat out with their research the day they arrive back. We expect the return period to have a recovery period.

It is also essential to remember that everyone will take different amounts of time to produce articles because of the varying nature of the activities they are doing. The problem then is: when do you start special pleading and when do you assume that a panel is aware that different kinds of activity have to have different lengths of time for recovery? Please do not put special pleading in to try and cover up inadequacy of output; use the special pleading to make clear points of relevance. Special pleading to try and portray something that is bad output as good output is simply going to alert the assessors that you have doubts about the work.

As for the question of whether output from one area will be judged differently from out put from another area: my role as chairman is to ensure that where cross checking is required it is done very early on. If we are seeing discrepancies we want to pick them up very early on and we will be dealing with them and we will be dealing with each other.

RAE2008

Professor Sir Leszek Borysiewicz, *Chair, panel A*

There is little difference between main panel A and main panel B.
A key issue is the sheer quantity of information that is going to arrive. Judging by last year's figures it can be expected that between 22000 and 23000 pieces of information will be submitted to Main Panels A and B; this is before factoring in expansion in some areas. The chances of a single paper resulting in a major change in grade is very low. Coordination is vital; panel A and B chairs are meeting every three weeks. For A and B, we are trying to get a venue where we can hold both our main panels and all our sub panels all at once in 2008. This will make sure there is real interaction, though finding an affordable venue may prove difficult.

The uniformity between all the sub panels is absolutely key, and cross referral is going to be really important.

There was a lot of debate about embellishing the definitions of grades, and this is where we disagree with B: we will not embellish the criteria that are published by the main RAE panel. A and B have stuck rigidly to the central criteria and we will leave the interpretation to the main panel chairs as the process continues.

Interdisciplinarity is also an issue for us, but for the reason that we do not see a single item being submitted to our sub panel that is not interdisciplinary by its very nature.

Outputs become very important, what we have been given is a grading that we have to make at the sub panel, we know that each grading is going to be in 5% block and 5 into 100 is 20, resulting in 20 blocks that you can put into slots from 14-1. There are four blocks that you can put in for environment, one for esteem, and fifteen that you can set up a profile in relationship to the output for the given institution. So single outputs are going to have little impact (unless they are from a very small institution) in terms of the scale you are operating in. You are asked to operate in 5% blocks. You will end up with normalisation around the 5% criteria.

Duplication has caused more discussion than any other topic and our final line is that we will allow duplication. We do not say that is has to be from different disciplines nor departments. The issue is though that we will expect you to be quite clear that you are duplicating a paper in RA 2. We will however be looking at the individual's contribution. That is where we have a potential conflict with the central board. While we will not be defining the percentage of

duplication we will identify, we will be saying if you want to use it we will draw a conclusion about your environment. If 25% of your total submission is one paper that says an awful lot about your institution. We will score differently for different contributions in the same area. There is no getting away from that in our field.

In terms of output, individual panel members can use anything they like (e.g. citations; impact factors). There will not, however, be a central system that will be applied using citations and impact factors.

Boundaries and overlaps are a big area for us and are going to be very difficult to predict. We are setting aside a month in 2008 to start looking for areas of boundary, overlap and cross-referral. We are anticipating that 30% of what we receive in main panel A will be cross-referred. However the grade will come from where the HEI originally submitted.

We also differ on the subject of early career staff. We will treat them by the definitions of the RAE, but we are taking an exceptional view of clinical scientists. If they are a true clinical scientist and they are in training, they will only be required to submit 2 outputs. This is specifically related to the service aspects of such positions. C staff, a very important large body of staff employed by the NHS, do not hold university contracts but are working in close affiliation. This will also apply to MRC units which are often embedded in universities. You will return these staff but the affiliation has to be overt, we will want to know that they hold an honouree in your institution and that has been agreed. You have to show a formal link between these staff and the university. Here again we are only asking for two outputs. We want to encourage these staff and make them more visible to us.

We also have a problem with the five new medical schools, these have a relatively low critical mass. We have organised the sub panel 4 and sub panel 5 which is other clinical- and laboratory-based subjects to take the whole submission of a new medical school, so they should not be disadvantaged.

We are looking at auditable objective measures in forms 5a and c, we believe that there is insufficient information coming in. The kind of things that we are looking for are clinical training fellowships, we will want to know how many you have, they have to have been peer reviewed, open to national level. Our own fellowships have to be distinguished from external ones that you have won.

RAE2008

Q & A Session

Questions

Q When can we expect some guidelines on multi-author papers, will we have to wait until January?

A The concern over multi-author papers from the point of view of the panel is that we are trying to assess research activity; it is not necessarily the case that a very good paper with ten authors reflects ten times the research activity of a very good paper with one author. We are keen that the contribution of an output with multi-authors should not be scored many fold for its contribution to a particular area of research. But if an output reflects a certain activity that

brings together different areas of biological science or biological science with other disciplines we will recognise what that output is reflecting in terms of research activity in those areas.

A If you have a multi-author paper with only one area of research involved we will expect only one submission of that paper. Whereas, if you have a multi-author paper which involves many areas of research, it may be submitted two or three times, representing each of these discrete areas of science.

Q Do you expect us to point this out in your text box?

A We would expect at the moment (although this may need clarification) to make an assessment for each of these inputs against the quality of that component of the output that we are looking at.

Q Say for example I had my name on an earth-shattering Nature paper with twenty different authors from different parts of the world, will that be scored as well as if I had my name on a paper in say the Biochemical Journal with a couple of people from the same department? Are there tactics for submission?

A We certainly cannot give advice on tactics. It is absolutely the case that whether the output is in Nature or the Biochemical Journal makes no difference to the assessment.

R There is confusion that was there in the original document and still there in your argument, you talk about multi-author papers as if they were exclusively output from multi-authors in the same department and that is not the issue. The issue is someone who has the choice of papers, one of which is by their PhD student in a good standard journal and one of which is a paper that is going to be much more highly-cited but with twenty authors from across the world, which one do we choose? I think the panel should give some advice about this.

A It is the case that if an output is submitted under somebody's name then that person must have made a substantial contribution to it. There will be the opportunity (and indeed we ask) for you to indicate the level of contribution to an output.

A It doesn't really matter whether your co-authors are in another place or your own department with the proviso that if the people in your own department have not made a substantial contribution to it and it is a single area of activity then we would expect only the dominant author to make that submission.

R You said it doesn't matter which journal it is in but I think in looking at the draft criteria, panel 14 was one of the few panels that didn't rule out using impact factors at all.

A There were two unfortunate words in there: "not necessarily". These two words have been removed and it quite clearly says now that impact factors will not be used at all.

Q Regardless of the number of authors on a paper, if it is inter-disciplinary are you going to send it off to the other relevant panels as cross-referral for opinion and if you do how are you then going to arrive at a panel grading?

A We would refer that output for the parts relating to other disciplines to the relevant panel and we would seek their opinion and assess accordingly. Outputs submitted to panel 14 will be graded according to the rules of panel 14 but if it has gone to another panel for advice then the grading according to our rules will be done in light of the advice.

A Every panel reserves the right to cross-refer and will take that advice but we will always score by the criteria of the panel that the HEI thought was the core panel that it was submitting it to.

R If you have got one department where you have a biologist and a mathematician collaborating, both can return it because it is different areas of biology within that department. But say on the other hand a very good paper has been joint authored by two authors from different institutions working in the same area, both authors want to return it and both authors say they made the dominant contribution: if it is a four star paper will both institutions get a four star rating? Papers returned from two different institutions should be given the same score.

A Yes I agree, but I am not keen on the idea of two authors claiming to be dominant. If they said they had contributed equally that would be fine. My view would be that if these two individuals are in two different places then clearly it reflects the research activity in these two place and they should be scored accordingly. We are assessing research activity and not individuals.

Q If you had a paper that came forward and there were contributions from people carrying out very specific and different techniques but in the same department, how would you count that contribution? Where does a specialist technique end and inter-discipliniarity begin?

A It is not black and white, not discontinuous.

Q The question that all will be asking when we get back to our departments is how much are they going to look at these outputs. You said you will look at them to the extent that you can assess them adequately, what does that mean?

A We are not refereeing the outputs, they will have been refereed already. We cannot say that we are going to spend the same amount of time on each output. We are going to spend as much time and effort on each output that is necessary for us in our professional judgement to form a sound assessment.

Q If you recruit young postdocs whose two or three outputs were produced at previous institutions, will that mean that the young postdocs work will not be graded on the merits of those papers?

A You take your outputs with you.

Q (JB) We might put a group into 14 and say it would be valuable if an opinion was sought from panel 1 or 2. I would hope that this would be seen in a favourable light, because one of the great difficulties in the biological sciences is that so many departments are hybrid; some departments sit clearly in the medical faculty as they are very biological, basic research and some vice versa. It is quite difficult to unpick these and actually one of the strengths is to build a team and put it in one unit, even though some of the people may not entirely match that unit. I would welcome comments from both side.

A (JB) My own view is that you are going to submit to the panel with the people that are most likely going to rate your work highest. What you are talking about is an issue that you probably want to write down to remind us that we should be doing proper assessment.

A We are not perverse (even if at times we appear so) in terms of the RAE, we are as concerned as you are to make sure it is as fair and as reasonable as it can be.

A Submitters are invited in one part of the environment to point out where the units of assessment do not match their organisation and I certainly share your view that having a hybrid organisation with lots of things brought together to stimulate each other is a good thing.

Q The concern is that there will be lots of rules, which despite your best intentions will turn out to be perverse in their operation. I actually have a far more important question to raise: who to submit? Now I think we are all clear that we submit our group leaders, our permanent staff that are paid through HEFCE, people that are paid through the payroll, but what about others that may have four good publications, they may be postdocs that are not independent or working within a group, they may even be technicians who have made a significant contribution to the paper, it is not clear to me where you stop.

A That would be entirely dependent on your vice chancellor and your vice chancellor's view of their university. Some may want their universities to appear only to produce four star outputs while others will be happy to put any outputs that may earn them money.

A (main panel A) If you submit eleven professors you will get the scores on the outputs of those professors but you will get zero for environment as we believe that is an unsustainable environment. What we want to see is a real scientific team, meaning that you actually have enough staff who are able to show sustainability of their unit. We are looking very much for teams that form the real core of that activity. It is your call but at the extreme there will be a penalty.

Q I was actually asking the opposite question, whether if you submit all the group heads and you still have plenty of spare papers left over whether you should submit them attached to a technician or to a postdoc who is not independent.

A They have to fulfil the rules of what constitutes an investigator returned under A. This is defined by contract; if they are in that contract band you can submit them. The call is then how many and who do you want to submit as long as they fulfil the contractor obligation.

A Inevitably postdocs have a definition of function of research and so they can be returned.

A We have to use our professional judgement when making an assessment and you have to use your professional judgement when choosing who to submit.

Q It is good that young staff can bring their outputs with them but are you expecting to distinguish between them and the poaching of established staff, whose outputs probably reflect research activity in another institution?

A The situation is that you are assessed on what you present. Since the last RAE there is very little evidence that it had any serious impact on the movement of staff amongst institutions.

A (main panel A) There is a serious issue here, in the last RAE because of the precipitous nature of the fours that actually occurred, one person could make a difference, but now all you

will get is the four outputs from that individual. If you take an institution like mine where you may be returning 800 people, adding one person even if they are a Nobel prize winner is actually not going to affect the end impact of the score because they didn't get in above the 0.5% threshold which will actually change the grading into a different area.

Q How will plenary lectures dealing with multiple areas be dealt with? Is it going to be one box per individual or one box per measure of esteem? How do you get a profile out of the four things we are allowed to write down?

A We want single items so plenary lectures are one of the four. We want to see how esteem is distributed throughout the department so we are not keen to be told that there are fifty plenary lectures in a submission of ten people and it turns out that two of the people had twenty-five each and the other eight none. We are asking that items of esteem should be identified with individuals.

A (Main panel A) We have a totally different view: if we had had our way we would have absolutely nothing on esteem at all, we were told we had to score it, we are asking through all our sub-panel submissions for half a page maximum on esteem, you are to highlight what the institution has actually achieved in that unit of assessment in terms of overall esteem and it will be a single score for the institutions. We will not be spending a lot of time dwelling on this.

Q I am a bit confused as to how the measure of the research environment is going to be published in terms of profile.

A As I understand the subcomponents of environment are not going to be published separately. There will be a profile for environment and the criteria of working methods indicates how that profile will be assembled.

Q What will the environment profile look like when it is finished?

A It will be a single profile there will not be a profile for each of the areas.

Powerpoint Shows

From next page…

Imperial College London

The Government's Science Policy

Sir Richard Sykes
HUBS / Bioscience Federation meeting
9 November 2005

"Those bastards, we've got to cut them back"

John Ehrlichman,
aide to President Nixon

The Government's Science Policy in 2005

- 10 Year Science and Innovation Investment Framework launched last year
- Overall Government awarded a high grade
- But persistent and looming questions over
  - Full Economic Costing
  - Teaching shortfalls
  - The next generation of bioscientists

Aims of FEC?

- Improve funding for infrastructure and move towards financial sustainability
- A "pay as you go" system that delivers investment funding now to replace assets as they are worn out

Cost of research at Imperial

- Full economic cost (FEC) of all our research was £332M in 2003-4
- Income was £172M (+ £75M from HEFCE)
- Loss of £85M
- RCs previously paid 46% "overhead"; industry overhead variable
- Universities subsidise research from investment needed to replace infrastructure

Neither sustainable nor acceptable

Where we are now …

- In 2003-04 Imperial recovered only 53% of FEC across all sponsors
- Should SRIF be phased out: implies future reliance on Institutional investment for estate repair & replacement
- So we have to improve recovery (% FEC) through achieving better prices for research projects
  - just getting the "***status quo price***" will cause our demise
- Overall recovery across **whole** research portfolio is vital
  - strive to improve %FEC on **every** project
  - recognise some may exceed 100% and some may not achieve 100% FEC (but we do them because we value the research)

Challenges for research providers

- Will FEC affect with whom universities do business?
- Will better information about our research activities lead to stronger central management?

Challenges for research funders

- Whereas RCs have been given new £…
  - Have OGDs?
  - Will Industry pay the extra cost?
- Will funders play games to get around FEC?
  - Go for the fixed price - 'do what you can for it'
  - Go via charities to get it done cheaper

Challenge for Government

- Will this decrease R&D activity in the UK?
  - Leading to a fall in international competitiveness
  - And knock-on effects for future RAEs…
- Will it be sustainable?
  - Will Government continue along this track when buildings fall down?

Research Fortnight

Universities fear full costs will mean less research

Teaching Annual Losses - after Tuition fees

Even with increased tuition fees to £3K, a significant shortfall will occur:

- Estimated £12K to teach UG lab-based students per annum
- HEFCE funding = £6.1K per UG student annually
- Funds from fees: £3K (less 32% of increase for bursaries) = £2.4K

= **£3.5K** loss per UG lab-based student per year

Annual Losses on Teaching after Tuition fees

- £3.5K loss per UG, Home/EU, lab-based student per annum
- Approximately 72% of Imperial HEU, UG students are lab-based (4,200)

Resulting in estimated **£14.7M FEC** loss per year

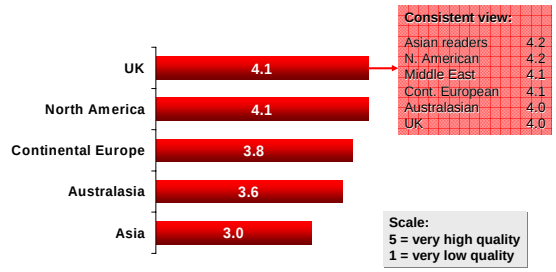
Consequences

- Difficulty in recruiting and retaining students & staff
- Deteriorating Teaching infrastructure
- Fall in standards?
- Financial dependence on international student market
- Effects on achieving/maintaining global competitiveness

Observations to ponder…

- It costs as much (or more) to stretch the most gifted intellectually as it does to bring up those who had a poor educational background
- Yet universities get no equivalent recognition as the Gifted and Talented stream in schools
- Higher fees would also mean more and higher bursaries

Rating of university education generally in each region



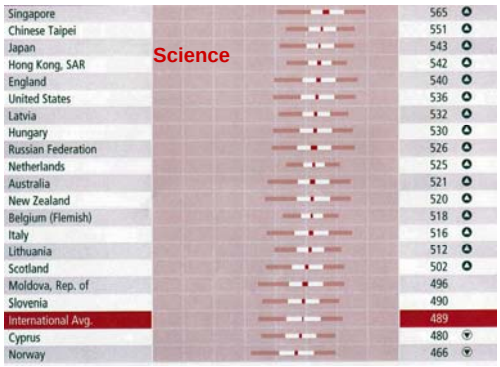
Consistent view:	
Asian readers	4.2
N. American	4.2
Middle East	4.1
Cont. European	4.1
Australasian	4.0
UK	4.0

Scale:
5 = very high quality
1 = very low quality

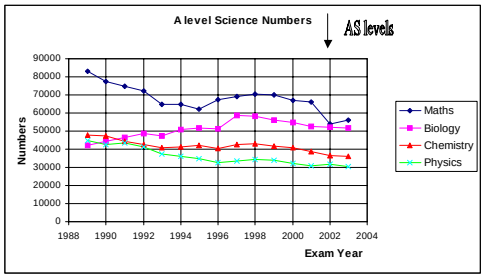
Base: all respondents

The Economist

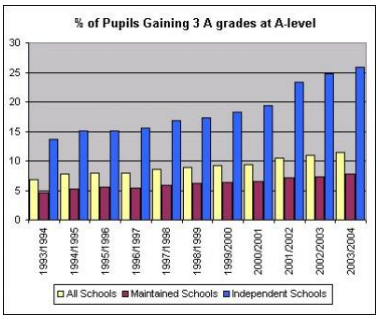
Science literacy (age ca. 14)

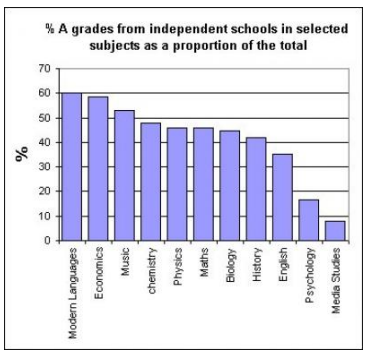


The general decline in science A-levels



Independent schools have an advantage in A levels





Thank you

Politics:

Science's unconquered frontier

Science and the current political agenda

July 2004: Govt launched a ten-year Science and Innovation Investment Strategy

Govt funding for science to rise from £3.9 billion to £5 billion by 2008= a doubling of cash spending since 1997

Wellcome Trust matching Govt commitment by investing at least £1.5 billion in UK research over 5 years

Spending on public and private R&D to rise from 1.9% of GDP to 2.5% by 2014-Will put UK at top of European spending league and much closer to U.S

The 10 year plan: What the government is asking of science and itself

- Research excellence
- Greater responsiveness to the needs of the Economy
- Increased business investment and engagement
- Strong supply of scientists, engineers and technologists
- Public engagement with scientific research and its innovative applications

Strong supply of scientists, engineers and technologists- what's happening?

- Education: there are signs that interest in STEM subjects is increasing
- Recruitment of science teachers improving but not at a fast enough rate to make a real net improvement
- Number of A level entries in 'core' sciences continues to decline
- Implementation of training bursaries and Golden Hellos to attract more science teachers good idea but not radical enough considering the scale of the problem

Science Education: the problems

Select Committee report on Science Education 14-16 (2002) noted the following problems:

inflexibility, irrelevance and repetitiveness of curriculum
- Lack of engagement in debate
- Limitations in practical and fieldwork
- Low educational value of coursework
- Unsuccessful implementation of ICT in science teaching

'many students lose any feelings of enthusiasm that they once had for science. All too often they study science because they have to but neither enjoy nor engage with the subject. And they develop a negative image of science which may last for life'

Public engagement with scientific research and its innovative applications

- Mori poll commissioned by Govt in autumn 2004:
- 80% of adults agree that science makes a good contribution to our society
- 65% believed that scientists told the truth
- 67% believed that scientists should listen more to 'ordinary people'
- 64% believed that the Media sensationalises science stories.
- Govt has promised to support informed public debate on controversial issues such as stem cell research and nanotechnology

More Public engagement with scientific research and its innovative applications

- Is another govern. aspiration but is science up for the challenge?
- Issues:
- Democratisation of science needed
- Top-down approach to engaging with the public must go
- Better media coverage
- Scientists have to learn how 'to do politics'

How to do politics…

- Scientists are somewhat engaged with the 'obvious' political debates on science and public policy:
- Climate change
- Stem Cell research
- Animal rights
- Scientists need to be less passive and engaged with the less 'obvious':

- Terrorism and the debate over the viability of biometric technology
- The use of 'evidence base' policy in government policy making
- The use of science in international development policy

HIGHER EDUCATION AND THE SCIENCES

Alan Wilson
Department for Education and Skills

SCIENCE IN THE BROADER HE CONTEXT

- Student numbers: increasing (50%) and widening
  - variable fees; bursaries
  - the benefits of wider access; gender in science
- Bologna: standards vs length of course
- Lifelong learning and cpd
  - Need for enhanced university-employer partnerships e.g. to accredit more cpd.
  - Role of SSCs
  - Huge opportunities; insufficient mutual understanding

Research

- World class and (where appropriate) critical mass
- This is what will ultimately drive demand?
- Research priorities: collaboration?
  - Achieving world-class research by region through collaboration?
  - Between departments? Between disciplines?
  - The Scottish experiment

Knowledge transfer

- Translational activities, applied research (e.g. in health)
- cpd, LLL – employer engagement
- Licensing, spin-outs
- Regional development: supporting the RES, RSS, RSP
- Foundation degrees – e.g. for technicians

The ten-year science and innovation framework

- A commitment to world-class research
- Greater responsiveness of the publicly-funded research base to the economy and public services
- Increased business investment and engagement
- A strong supply of scientists, engineers and technologists
- Sustainable and financially robust universities and public laboratories
- Increased public confidence and awareness

DIFFERENT KINDS OF SCIENCE

- enabling disciplines
  - maths, modelling, computer science
- basics – understanding the core systems
  - physical sciences
  - life sciences
  - social sciences
- applied – problem and task (employer) focused
  - engineering
  - medicine.....

- the interdisciplinary imperatives become immediately apparent:
  - molecular biology needs mathematics, physics and chemistry
  - engineers need many basic sciences, and design skills
  - transport engineers needs mathematical methods developed in physics
- breadth and depth; toolkits and specialisms

Curriculum challenges

- academic vs. vocational
- increasing demand: strategic subjects
- GCSE: 'double science' vs specialist disciplines?
- A-level: increasingly specialist, less attractive?

- meeting the challenge of the new: more systems science relative to reductionist science: the rise of physiology?
- curricula spanning enabling, basic and applied disciplines – in that order?
- universities: rooted in the traditional disciplines, but many new approaches
- sufficiently joined up with school curricula?

Strategic Subjects – Different Categories?

- STEM
- Minority subjects – some languages etc
- Employer-related – SSCs
- Problem/issue related: public service delivery and 'big' social science

MOVING FORWARD: THE CHALLENGES

- The B F headings: mostly funding-related?
  - Units of resource
  - Research overheads under FEC
  - Purposes of QR and HEIF
  - Recruitment and retention
  - Inadequate support for RC responsive mode; and for young researchers
- But also supply of STEM students – biosciences within STEM

Government should continue in the general direction set out in the 10-year framework. Funding must not be cut back since the UK is still only 6th among G8 nations in science spending as a proportion of GDP

- The Government's remains committed to the framework
- Its long-term ambition is for public and private investment in R&D to reach 2.5% of GDP by 2014
- Funding for UK science base over the 2004 Spending Review period (2004-05 to 2007-08) will rise at an average annual rate of 5.8% in real terms
- The intention is that investment in the public science base will increase at least in line with the trend growth rate of the economy through the ten-year period, increasing science spending as a proportion of GDP.

Unit of resource for teaching science subjects in universities does not cover the cost of courses. Graduates leave most universities with insufficient practical training for R&D careers

- HEFCE is conscious that the underlying problem is that all teaching is underfunded. Within a constrained funding envelope, we cannot simply alter weightings. We can seek to protect the unit of resource for teaching in the forthcoming Spending Review.
- Capital funding through SRIF and HEFCE teaching capital is a major advance
- And variable fees!!
- Isn't training for R and D careers a curriculum issue?

Lack of clear mechanisms for meeting research overheads under fEC could lead to a decrease in research volume. It is essential not to price-out industrial collaborative research, nor to make Britain's European Union grant applications non-competitive

- It is open to HEIs to undertake commissioned research funded at less than FEC, to the extent that they are able to support this from other funding available to them; and in particular to use funding council (QR) research grant as support.
- There is the new charities support element within QR to be introduced from 2006-07.
- But we will review QR in the future and seek to clarify its role

Uncertainty as to the ability to recover full economic costs of research carried out, depending on the nature of the funder (Q9 of survey)

- The aim of the Government and HEFCE is that HEIs should over time achieve a better balance between the cost of all of their research (and teaching and other activities) and the funding *from all sources* that supports this. Working with OST, we are supporting this.
- Again, review of QR

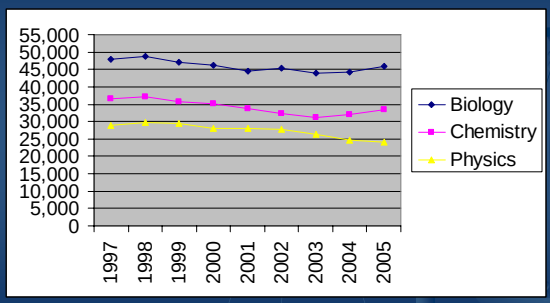
Increased centralisation of funding decisions such as OST allocating a larger tranche of the science budget, and some of the money to the Research Councils being ring-fenced for specified initiatives, is reducing the sums available for responsive-mode funding and restricting freedom of inquiry;

- We don't think that there is significantly increased centralisation.
- The bulk of the Science Budget money is passed across to Research Councils in accordance with agreed operating plans produced by the Councils.
- Very little Research Council funding is specifically ring-fenced, and in most cases this relates to additional funding obtained from Treasury in the periodic Spending Reviews.

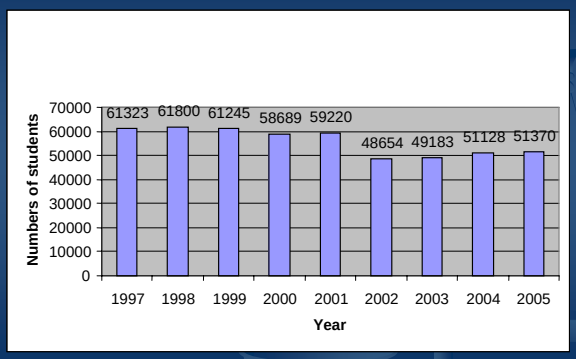
STEM

- There is a large number of STEM initiatives
- Some are working – because there are some increases in A-level science and ug admissions
- We are seeking to coordinate more effectively, focussing on
  - Teacher recruitment and support
  - Teacher cpd
  - Aspiration raising activities for students

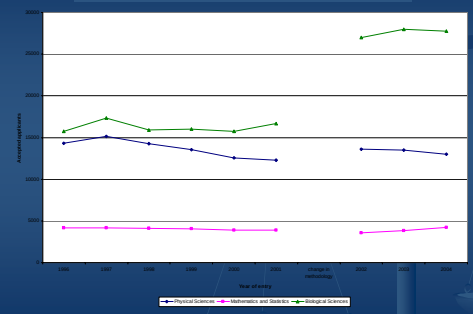
A Level Entries for Science Subjects Among 16-18 Year Olds



A Level entries for mathematics and further mathematics by 16-18 year olds



UK domiciled applicants accepted through UCAS to full time undergraduate courses at UK institutions



UCAS - 2005 entry

- acceptances (all subjects) are up by 7.8%
- chemistry acceptances are up by 12.5%
- mathematics acceptances are up by 10.4%
- physics acceptances are up by 10.3%
- biology acceptances are up by 7.1%.

Final figures will be published by UCAS in January 2006

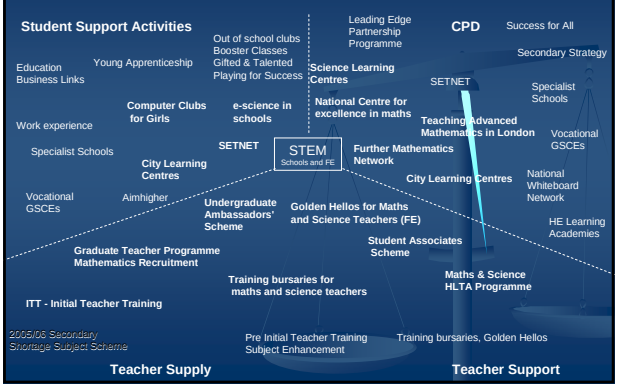
DfES/OST initiatives

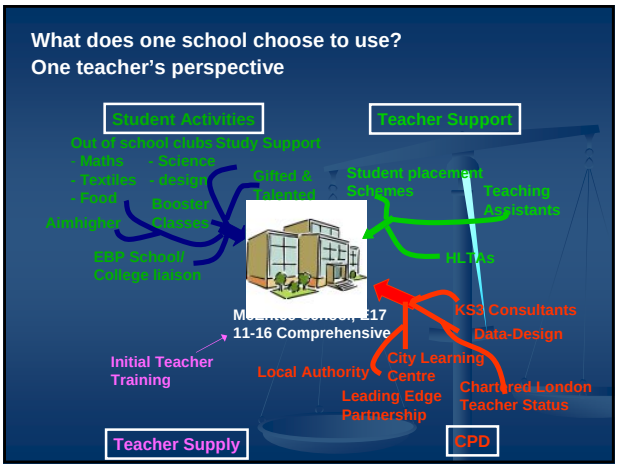
- teacher recruitment and support:
  - improved salaries for science teachers
  - increased teacher training bursaries; golden hellos
  - attracting more women into science
- cpd: National Science Teaching Centre, and regional centres; Senior Maths Adviser; TDA commitments

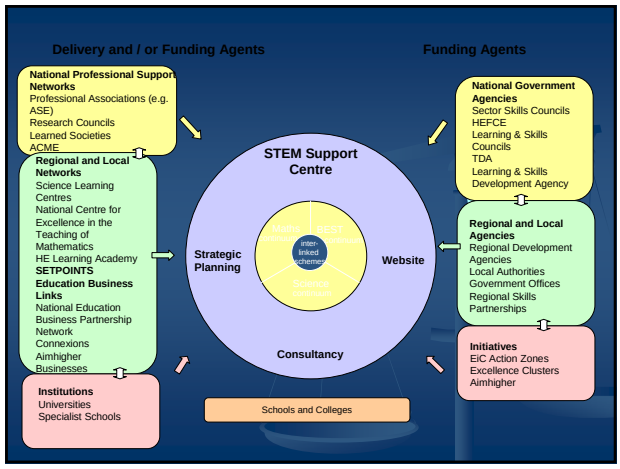
Reforming the STEM support system

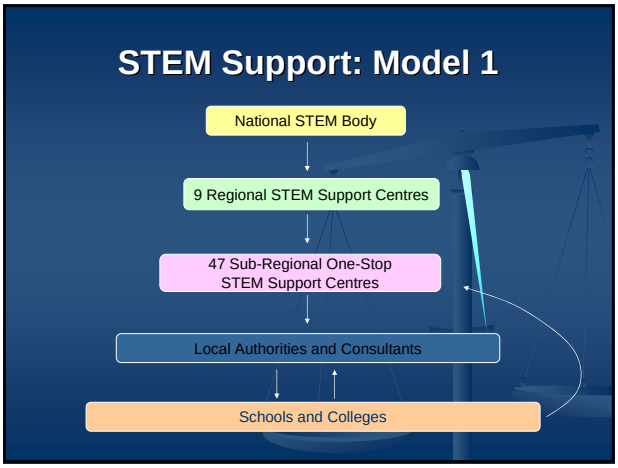
- the current range of initiatives facing a school
- a school now
- possible layers
- different roles: DfES, TDA, major funders, such as Wellcome, learned and professional societies, universities themselves

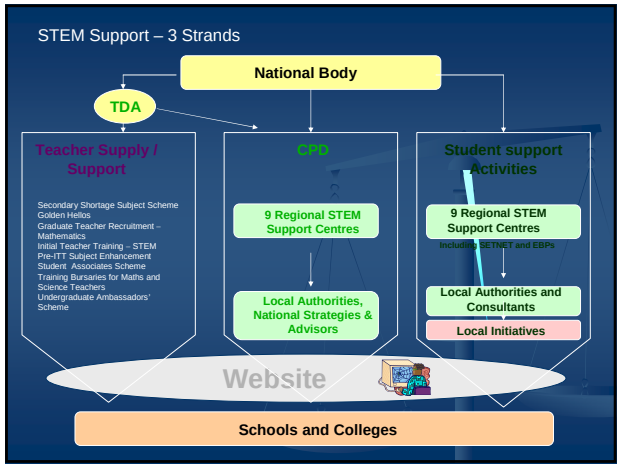
What is impacting at the front line? – a secondary school











Universities and STEM

- specialised mentoring schemes
- more of Imperial-Leeds (GSK, Rothschild) schools science support schemes?
- university schools/academies? Brunel giving a lead. Trust schools.
- effective progression

Schools and colleges

- engaging with cpd
- seeking out university partners
- promoting enabling disciplines: maths for all?!
- better careers advice

Professional institutions and learned societies

- enrichment of the student experience; aspiration
- forceful and effective collaboration?
- supporting interdisciplinary development?
- careers promotion

CONCLUDING COMMENTS

- the ten-year framework commits the Government to the support of science
  - a commitment to supporting the research base full economic costs
- but need to establish a thriving STEM base
  - by coordinated STEM initiatives in schools and colleges, supported by universities and professional and learned societies
- and there are significant challenges to be met by universities who are not passive partners in this enterprise – e.g. on future curricula developments, on interdisciplinarity; and supporting the STEM base

RAE Main Panel

- Co-ordination between Main Panel A & B
- Uniformity between all the sub-panels in Main Panel A & B
- Criteria of grades – no embellishment (sticking strictly to the central RAE definitions)

RAE Main Panel A

- Outputs
  - *Duplication*
    - Major issue of discussion
    - Overuse will be penalised under environment but no absolute %-age defined.
    - Wherever used will need to define the role of the investigator (RA2 – 50 words maximum)
    - Depending on comments relating to the output, each use of a duplicated paper may score differently (possible clash with RAE approach on scoring)

RAE Main Panel A

- Outputs (contd)
  - Use of citation/impact factors – individual panel members in their assessment but no central analysis will be used.
- Boundaries and overlaps
  - Difficult to predict – HEIs will need to make up their own minds based on queries and panel membership
  - Full use of cross-referral to other sub-panels

RAE Main Panel A

- Careers
  - Early career staff will be given full support as recognised in the RAE advice.
  - Clinical scientists – absence of CCT by 30 April 2007 will only require two outputs (not looking for 4 at all regardless of situation)
  - 'C' Staff
    - Affiliation has to be overt
    - Only two outputs required
- Objective measures in form 5a-c
  - Clinical training fellowships, overseas funding etc.