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# RSC Policy Bulletin

## Dr Lesley Yellowlees, chair of the RSC Science and Technology Board, introduces the first issue of the RSC Policy Bulletin

What does the RSC do for us? What is it doing to protect chemistry in the UK and help it flourish and grow? What is it doing to communicate the importance of chemistry to policy makers and politicians? These are just some of the questions that RSC staff and committee members are constantly asked. To try and provide answers, we have produced this bulletin outlining the many activities and policy initiatives the RSC is involved in.

The RSC carries out an enormous amount of policy work ranging from investigating the state of school laboratories to the funding of university chemistry teaching and research. Recently reports have been published on subjects as diverse as chemical science spin-outs from UK universities, chemical science priorities for sustainable energy solutions and good practice in university chemistry departments. The RSC also makes submissions to Parliamentary select committees, government departments, research councils and European bodies; in fact, basically to any relevant body that affects the chemical sciences.

In addition, the RSC runs workshops in emerging interface areas such as biomaterials, nanotechnology and the chemistry of ageing. More recently the RSC has held science policy seminars jointly with other learned societies and on our own. These seminars are targeted at policy makers, including MPs, and have been held on topics as diverse as science and crime, science and transport and the science of drug addiction and treatment.

In my experience, the majority of members are unaware of the amount of work the RSC does in the area of science policy. The RSC Policy Bulletin hopes to correct this. We hope that this extra information is useful and gives you an insight into our policy agenda. If you have any comments, the editorial team would be very happy to receive them.

*Dr Lesley Yellowlees*
*Chair, Science and Technology Board*

**TELL US WHAT YOU THINK**

The RSC Policy Bulletin will be published three times a year. We would be delighted to received feedback on the first issue. Any comments should be directed to the editor: Dr Rachel Brazil: Tel:+44 (0)20 7440 3305, Email: sciencepolicy@rsc.org



RSC | Advancing the Chemical Sciences

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# Utopia or reality?

How can chemistry departments ensure equal opportunities for all? The RSC's report on *Good Practice in Chemistry Departments* describes how some universities are achieving this.

**As part of its continuing work on diversity in chemistry, the RSC recently published a report on *Good Practice in University Chemistry Departments*. The report describes the culture needed to support academic staff of all genders and backgrounds using analysis from a broad range of UK chemistry departments.**

## Gender imbalance in chemistry

Gender balance in chemistry compares well with other science, engineering and technology (SET) subjects at undergraduates and postgraduate levels; approximately 42% graduating at undergraduate level are female (compared to a sector average of 56%). However the proportion of women at post doctoral level falls to around 25%. As Professor Julia Higgins stated in the RSC's 2003 report, *Recruitment and Retention of Women in Academic Chemistry*, '*if these young women are leaving chemistry completely, the waste that this represents for chemistry and for the women themselves is unforgivable.*'

The situation in chemistry has improved, but there is still a long way to go. The most recent figures show that 4% of chemistry professors are female compared with 14% for the whole HE sector.

Previous work by the RSC suggests that whereas both men and women benefit from 'good practice', women in particular are adversely affected by 'bad practice'. The current report, showcases the good practice found in many UK chemistry departments via a description of the chemistry department at the University of Utopia.…

## The University of Utopia

The University of Utopia campus is in a pleasant part of the city, well-served by public transport, with open views and plenty of trees. The campus is a few minutes by car from some of the best local authority primary and secondary schools and has its own well-regarded day nursery.

The chemistry department occupies a much-adapted building with a welcoming entrance hall. Staff pigeonholes are located outside the recently refurbished common room whose comfortable chairs and free tea and coffee assure good use. The notice board in the entrance hall is kept up to date with photographs and contact details for all staff, including an indication of days worked by part-time staff and job-sharers.

Photographs in departmental publications reinforce and recognize the success of women at all levels; from the mature second year student featured in the undergraduate prospectus, to the photograph of the mixed department cricket team on the corridor wall. The department's annual report gives pride of place to a feature on their female professor who was recently awarded an FRS.

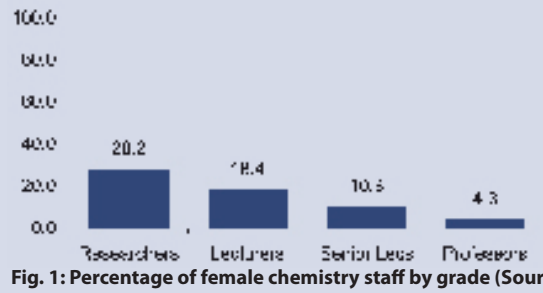


**Fig. 1: Percentage of female chemistry staff by grade (Source: HESA)**

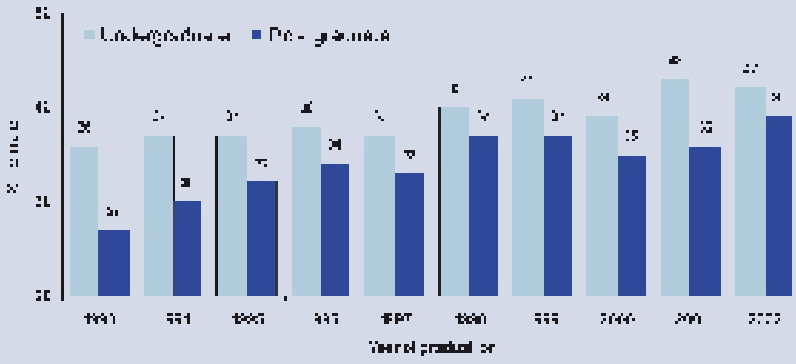

**Fig. 2: Percentage of female chemistry students graduating (Source: HESA)**

## Management changes

Change at the University of Utopia took time. A review in the late 80s recommended the merger of inorganic, organic, physical and theoretical chemistry sections but no action was taken until the university forced the department to make management changes ten years later. Previous departmental heads had the job for life, but now the headship rotates every three years.

The rotation of senior management posts now means that there are at least two academics with experience from whom a new head of department can be appointed. Bearing in mind the coming pattern of retirements, younger members of staff are also being given administration experience. The department now has an open review and reallocation of duties at the beginning of each academic year.

The results of the last RAE were an unpleasant shock to the department and the university alike, but this has proved to be the catalyst for action, bringing together the department's young academics in a campaign for team success. The lower than expected RAE score focused everyone's attention on problems and constraints and what could be done to turn things around.

## Transparency in promotions

Issues surrounding promotions within the department have been difficult in the past. Recently the head of department tackled this issue by producing detailed information on recent promotions and the criteria these candidates met, including publications, teaching, grant applications and other successes. This information is now available on the department website alongside the university promotion criteria and is featured in the annual open

meeting for staff which the head of department holds before the start of each promotion round.

### Supporting staff

The department is big enough for good science but not so big that people don't know each other. The younger academics are given a lot of support but feel they are fulfilling the role of an independent academic. They are encouraged to make decisions and are allowed to make small mistakes. The department gives new lecturers a postgraduate studentship and a start-up grant of £20K over three years.

The recent job-share in one of the administration posts took time to settle down but the department can now see the benefits of having two people with different skill sets. Rather than burden the small number of women academics on the staff, the department sent one of their senior administrative staff on a counselling course so that she can support the department's welfare tutor.

Recently one female academic has chosen to go part-time but the financial saving has been left with her research group to support any difficulties experienced and to allow her to return to full-time in the future. The head of department works from home when necessary so he can take his share of child care duties. The age-range of the department and their offspring have prompted a thriving cottage industry in baby-sitting!

### Utopia or reality?

The University of Utopia may not exist exactly as described, but it does represent some of the progressive 'good practice' implemented by a number of UK chemistry departments. The RSC hopes that its report will help to spread this 'good practice' to all universities.

**More about the RSC work on diversity in chemistry can be found at: www.rsc.org/policy or from Dr Sean McWhinnie (mcwhinnies@rsc.org).**

# Chemical science spin-out companies

## A comprehensive survey of UK universities spin-outs concludes that more funding and research facilities are needed to encourage new ventures.

### Key recommendations

- More needs to be done to share best practice between TTOs. They need experienced staff with industry/start-up 'savvy'.
- The realistic provision of resources for IP filing and protection needs to be addressed. At present, no university or spin-out could realistically finance the prosecution or defence of patents.
- The UK needs more science parks with multi-occupancy buildings where 'wet chemistry' facilities and specialist equipment can be shared cost effectively.
- Lack of experienced business management undermines spin-out activity. Schemes such as the secondment of commercial managers and mentoring from successful CEOs should be considered.

**The Chemistry Leadership Council and the RSC have combined their resources to examine the climate for innovation in UK universities and the factors which influence the success or failure of spin-out companies. The report of this study, published in March 2005, is intended to form the basis of a national government strategy to encourage new ventures. Following publication, Lord Sainsbury, Minister for Science and Innovation, hosted a dinner and workshop to discuss the key findings.**

### Spin-outs share characteristics

The final report identifies over 100 chemical science spin-outs in the UK. Analysis of the geographical spread identifies major clusters of activity, predominantly around research intensive universities such as Oxford, Cambridge, London and Manchester. However, there is clear evidence that other chemical based clusters are developing. In general, chemical science spin-outs remain close to the university from which they were started. This enables the new venture to maintain close links with the initiating institution which provides direct access to supportive research, skilled graduates, specialist equipment and effective networks. Whilst each cluster is fostered by its local Regional Development Agency, the report recognises that all spin-outs have similar interests and a national strategy would help make the most of the limited resources available.

### Lack of experience in TTOs

The report also calls for university technology transfer offices (TTOs) to share best practice. Knowledge transfer is a complicated process which is influenced by several, often conflicting factors. There are some excellent TTOs in UK universities but some lack credibility due to insufficient industrial experience amongst their personnel. Many TTOs feel the commercialisation process is significantly constrained by lack of resource and that with more funding they could achieve more with the Intellectual Property (IP) they have at their disposal.

### More science parks are needed

Among the key messages in the report is the need for suitable UK-wide science

**The RSC report concludes that more Science Parks are needed.**

parks, with multi-occupancy buildings. These would offer companies access to 'wet chemistry' facilities and shared specialist equipment that they could otherwise not afford. A science park address will also increase a company's credibility as a viable business to outside investors. There is a significant shortage of such facilities in the UK and this ultimately affects how quickly university spin-outs can progress.

### Crisis in IP management

Universities show a general lack of realistic financial provision for IP filling and protection. In almost all UK universities, ownership of IP is held by the institution, rather than the academic and this means that the costs of maintaining and defending patents will fall on the shoulders of the university. This should include ongoing monitoring to ensure that patents are not being breached and the funds to defend patents held by the university if they are challenged.

The report concludes that the need for long term resources to properly administer a growing portfolio of patents is not understood by some universities. A crisis of IP management is in the making.

Likewise, new spin-outs are almost inevitably in the pre-revenue phase of their life. They are in a poor position to carry the costs of prosecution or defence of patents and may be forced to restrict the geographical coverage of patent filings to match their financial means. In the long run, with industry evolving globally, this could prove a liability.

### Weak business management

A lack of experience in business management among academic spin-outs significantly undermines their prospects for success. This business management expertise is generally needed in the early stages of development. Inventors with academic backgrounds are not always equipped to deal with the range of issues faced by a start-up venture. In the USA, the business angel investing community often performs this role.

The report proposes the secondment of commercial managers into university spin-outs as one possible solution.

### Sparse funding for new ventures

A major hurdle to spin-out creation is the lack of 'seed capital' funding. Most universities have now invested their 1999 'University Challenge' seed fund monies, awarded by the Office of Science and Technology. They now have no mechanism for seeding new companies after the proof-of-concept stage. This is exacerbated by the difficulty in attracting private investment for spin-outs. In order to alleviate the situation, some universities have formed a preferred relationship with a single venture capital organisation. Early indications are that this approach may work well.

As they mature, some companies also find it difficult to raise 'intermediate' size follow-on funding; around the £0.5-2m mark. There are also substantial differences in funding available for different technology segments. Chemistry/materials related businesses have particular difficulties in this respect.

### Future RSC actions

The workshop following publication of the report, addressed how to move forward in light of the recommendations made. Over the coming months the RSC will consider what more it can do to support spin-outs.

**For more information, go to www.rsc.org/policy or contact Dr Alison Braybrook (industry@rsc.org).**

# REACH: The RSC response

The proposed new European Commission regulatory framework for the control of chemicals has many ramifications for the chemical industry in Europe. Whilst welcoming a single harmonised regime, the RSC has significant reservations.

**At present, the RSC has significant reservations about REACH (Registration, Evaluation and Authorisation of CHemicals) - the proposed new European Commission Regulation for the control of chemicals; there are problems with its scope, practical workability and some of the principles it is based on.**

REACH has been largely driven by public concern about the effectiveness of current chemicals legislation in protecting our health and environment. Under REACH, enterprises that manufacture or import more than one tonne of a chemical substance per year would be required to register it in a central database. All chemicals produced in quantities greater than 10 tonnes will need a risk assessment and 'high risk' chemicals will be restricted to essential uses.

REACH removes the distinction between 'new' and 'existing' chemicals listed in the 1981 European Inventory of Existing Commercial Chemical Substances.

REACH will replace nuch of the Dangerous Substances Directive (67/548/EEC) for new substances, the Existing Substances Regulation (793/93), the Marketing and Use Directive (76/69/EEC) and the Directive covering Preparations (88/379/EEC).

The first reading in the European Parliament (EP) of the proposed regulation is scheduled for November 2005. It is expected that the REACH will be agreed and published in June 2007.

## The REACH system

The REACH Regulation shifts the burden of proof from the authorities to industry, which will now have to demonstrate that a chemical can be used safely for a specific use.

Manufacturers, importers, and, for the first time, downstream users, will have to provide information to enable the end-user to manage the risk.

While the RSC supports the basic principle that all users of chemicals should have access to the necessary information to be able to manage the risks, this should not extend to providing detailed commercially sensitive information that would impact on competitiveness without providing any useful benefit.

## Registering chemicals

**Registration** is the main element of REACH. Chemicals manufactured or imported in quantities of more than one tonne per year (around 30,000 substances) will need to be registered. This involves providing information on intrinsic properties and hazards and on safe ways of handling the chemical for specified uses. The information required would be proportional to production volumes and the risks posed by a substance. Around 80% of all registered substances are likely to require no further action.

## Evaluation: risk vs hazard

**Evaluation** of chemicals encompasses several processes within REACH, including the checking of information dossiers of substances to ensure completeness, and substance evaluation by a competent authority. Evaluation is triggered by the volume of the substance imported or manufactured. In addition, evaluation will be needed where there are justified reasons to suspect that a substance poses a risk to human health or the environment.

It is vitally important that REACH should be based on risk rather than just hazard based. The concept of risk requires an examination of both hazard and exposure levels. This is a better measure, as it takes into account the actual likelihood that an intrinsic hazard associated with a substance will cause actual harm.

The RSC is concerned that prioritisation by volume will result in an inappropriate use of resources. By focusing on the volume of chemicals produced or imported, the danger exists that effort may be misdirected on high volume but low toxicity substances such as sodium chloride – common table salt, rather than on substances of high concern used in smaller quantities.

The Commissions view that testing on animals should be minimised is shared by the RSC. Under REACH, organisations would be required to share data in order to reduce animal testing. It would be unethical to require animal testing simply to complete a bureaucratic box ticking exercise.

The RSC does have concerns about the inappropriate use of non-animal, in silico and in vitro techniques. More work is necessary to develop suitable non-animal models. Although non-validated models might be useful as screening tools, they should not be used for decision making.

It is important that REACH should only require data that has real value. This is particularly true for 'existing chemicals' that have been in use for many years with no apparent adverse effects. Testing thresholds should, where practicable, take account of estimated actual exposure and potential impact. There should also be greater acceptance of scientifically reliable historical data.

## Authorising and restricting use

**Authorisation**, for specific uses, will be required for about 1,500 substances of very high concern. The European Commission will be responsible for authorisation.

Substances of very high concern include CMRs (carcinogenic mutagenic or substances toxic to reproduction), PBTs (substances of very high concern that are persistent in the environment, bio-accumulative and toxic), vPvBs (very persistent and very bio-accumulative substances) and other substances identified as having serious and irreversible effects to humans and the environment, for example certain endocrine disruptors.

Where the risks emanating from the use of such a substance are minimal or can be adequately controlled, authorisation would be granted. Under REACH, some substances of very high concern may be subject to **restriction**. These decisions would be made by the European Chemical Agency, which will be based in Helsinki. It will look at the level of risk, whether the use of the substance was socially and economically important as well as the availability of substitutes.

## Chemical substitution

Chemical substitution is one of many options in the process of reducing risk. Substitution is not a simple process since


**Will REACH protect human health and the environment or simply decrease chemical diversity and industrial innovation?**

it is necessary to ensure that the overall risk is reduced and that a decrease in one risk is not overshadowed by the increase in another. Many practical aspects of decision making for substitution will need to be resolved. Effective substitution of a problem chemical by an alternative requires an adequate set of comparative data for the alternative.

A further problem is that of defining the key hazardous property; chemicals cannot be ranked in order of safety - they have hazard profiles whose ranking differs. Then there is the issue of how different impacts are to be weighted.

Another difficulty will be agreeing the purpose of substitution i.e. for safety or for sustainability. A safer chemical may be used in larger amounts, use more energy and/or may generate more waste. Finally, the difficult issue of how to assess the cost vs. benefit of substitution will need to be addressed. For example, should substitution be required if it costs £100K to improve safety by 0.01%?

The RSC opposes any moves to extend mandatory substitution beyond those substances for which risks cannot be adequately controlled. Authorisation provides a sensible mechanism to exert control on hazardous substances and substitution is a desirable endpoint. But decisions on substitution needed to be taken in a holistic manner.

## Chemical diversity

Impact on chemical diversity is a particular concern of the RSC. It is not clear whether authorisation is to be a temporary stay of execution or just a stricter form of control for some chemical substances. If it is the former, this would contribute to a reduction in chemical diversity which could in turn have an impact on innovation.

There is concern that REACH could lead to useful chemicals being withdrawn unnecessarily due to the high cost of testing, rather than for health, safety or environmental reasons. A similar situation has already resulted from recent EU directives for agricultural products. 60% of active substances have been withdrawn in plant protection products and probably an even larger proportion of active substances in biocide formulations.

## Making REACH workable

Ensuring the Commission produces workable legislation is a key concern of the RSC. To this end, the RSC has made a number of submissions on aspects of REACH to the European Commission, UK Government and to Committees of both Houses of Parliament. The RSC has a representative on the UK Chemical Stakeholders Forum (UKCSF) that advises the UK Government on the REACH Regulation.

In December 2004, the RSC ran a multi-stakeholder workshop on chemical substitution that was opened by the then Minister of State for Rural Affairs and Local Environmental Quality, the Rt. Hon. Alun Michael MP. More recently the RSC has, at the request of the UKCSF, provided advice on the practicalities of undertaking chemical substitution and on 'chemicals of equivalent concern'. In June 2005, the RSC hosted a European Chemical Societies (EuChemS) REACH Workshop.

There will be a continuing need to maintain co-operation between regulators, industry, government and consumers in order to develop and deliver the most positive outcome for REACH.

**For more information , go to wwww.rsc.org/policy or contact Dr Steven Lipworth (lipworths@rsc.org)**

# New materials for sustainable energy technologies

New materials are key to advances in sustainable energy technologies, but how should we support research in this area? A recent RSC workshop concludes that there are too few researchers in the UK.

**In November 2004 the RSC organised a workshop on materials for sustainable energy technologies. The workshop report concludes that there are too few materials chemists applying their research to sustainable energy technologies, perhaps less than 1% of all UK materials chemists. To attract more scientists into energy related research, delegates called for the UK to adopt a more coherent, streamlined and collaborative research strategy.**

The event was hosted by the Environment, Sustainability and Energy Forum (ESEF) and the Materials Chemistry Forum (MCF) and was sponsored by the EPSRC. The workshop brought together materials chemists and scientists working on different sustainable energy technologies, to assess present progress and discuss a future strategy for the UK.

Chaired by Professor Peter Bruce (St Andrews), the workshop, heard from a diverse range of speakers, covering the hydrogen economy, photovoltaics, fuel cells, lithium batteries and nuclear energy.

A series of breakout sessions generated some consensus on the problems for researchers in the UK.

## Strengths in materials research

The workshop report states that fundamental materials chemistry research in the UK is of a high quality and there are pockets of excellence in several areas of relevance to sustainable energy technologies.

These include photovoltaics, solid state electrochemistry and the synthesis of new functional materials for application in energy saving electronic devices.

## Too few researchers

As demand for cleaner, more efficient and more economical energy production grows, so does the need for scientists and engineers who can provide the necessary technology.

One of the main problems voiced by workshop participants was the dearth of UK materials chemists working in areas relevant to sustainable energy technologies.

## Long term, multi-disciplinary thinking

The report considers that long-term thinking is also essential to reflect the strategic importance of the area. Long-term support for both responsive mode and targeted funding programmes would ensure the continuity of research projects and personnel within universities. There is notable progress in the UK towards this aim, including the EPSRC's SUPERGEN initiative and the recently established UK Energy Research Centre.

Multi-disciplinary working is critical in advancing research in sustainable energy technologies, but little incentive exists to carry out such research in the UK. Contributing factors such as the Research Assessment Exercise (RAE) and a lack of communication between different disciplines are singled out in the RSC report. In particular there is a lack of contact between chemists and chemical engineers.

Criticisms of a lack of central infrastructure to bring energy related research together may now be addressed by the UK Energy Research Centre (www.ukerc.ac.uk), established in 2004 and funded by the UK Research Councils for 5 years. The centre has its headquarters at Imperial College. It aims to pursue its own whole-systems research programme and establish a National Energy Research Network to bring coherence to the diverse range of UK energy research activities.

## The 'development gap'

Another major issue identified in the workshop report is the need to bridge the gap between academic research and the initial stages of technology development.

Large-scale collaboration is needed to drive early-stage development work. The 'development gap' stems from the lack of funding for the initial stages of development and the cultural divide between academia and industry. In addition, the decline in large-scale corporate R&D investment is particularly acute in the UK. Opportunities to collaborate with industry and the availability of additional industry funding are no longer as widely and readily available. The report recommends tax breaks and other financial incentives to encourage industry to invest in the initial scale-up and development phases of bringing sustainable energy technologies to market.

**Materials technology holds the key to sustainable energy technologies**

## Follow all research avenues

Workshop participants found it difficult to predict which sustainable energy technologies were likely to be dominant in 50 years time and were adamant that the UK must not narrow its focus to preclude any research avenues. It is certain that the field in general will grow in importance as our need for alternative energy supplies becomes more immediate. Will the UK be equipped with the materials technology to meet this need?

**For more information on the workshop and report, contact Dr Rachel Brazil (brazilr@rsc.org).**

# The Future for UK Chemistry Departments

After the closure of well-established departments such as Kings and Exeter, the RSC is working as hard as ever to ensure there is a future for UK chemistry. Professor Rodney Townsend, Director of Science and Technology, gives an insight into the RSC position.

**Just over 40 universities now teach chemistry within the UK. Will this provide enough skilled graduates to meet our needs?**

**Over the last ten years approximately 30 chemistry departments have been closed within UK universities, leaving us with just over 40 remaining. There has been a recent rash of department closures including well established departments such as Kings College London, Queen Mary College London, Swansea and most recently Exeter. The closure of such departments is causing alarm not only in the academic community but also in industry and government. Closures are occurring not just in chemistry but in other key sciences, such as physics (Newcastle) and mathematics (Hull).**

## Funding councils

The major cause for the closure of university chemistry departments is the policies of the funding councils, especially those of the Higher Education Funding Council for England (HEFCE). Recent closures have not just been due to declining student numbers as is often assumed.

HEFCE fails to recognise the true costs of training and educating students in laboratory based subjects. Funding is calculated using a rigid formula based on student numbers and subject type. The formula does not take into consideration the particularly expensive nature of chemistry. Laboratories need to be maintained and chemicals constantly replenished making chemistry one of the most expensive subjects to teach.

The HEFCE funding formula is damaging and urgently needs reviewing. Unfortunately, the problem has been exacerbated by the recent HEFCE 2005-6 settlement for research funding. This has further damaged the viability of chemistry and chemical engineering faculties.

## Lobbying government

The RSC continues to lobby hard to persuade government of the importance of chemistry to the UK and the need for it to take action to prevent further closures of university science departments.

Over the last few months staff and members have met with Government Ministers (Charles Clarke, Kim Howells, Lord Sainsbury) and MPs; the heads of research councils and funding councils; and with a number of vice chancellors, including Michael Stirling, vice chancellor of Birmingham University and the current chairman of the Russell Group of research intensive universities.

## Chemistry is vital

In all the meetings the message is consistent: chemistry is vital for the UK's future. Developments in areas such as health, biotechnology, materials science,

sustainable energy, crime prevention and information technology all rely heavily on the molecular sciences. Chemistry is at the core of future scientific advances and is key to future wealth creation in any modern society.

This has been explicitly recognised by the European Commission and has been highlighted in the current priorities for the new European research programme, Framework Programme 7 (FP7). Sadly, the importance of the chemical sciences has not yet been adequately recognised by the UK government. We continue to campaign vigorously to obtain this recognition.

### Universities under pressure

In discussions over departmental closures, the Government has been keen to stress that universities are autonomous bodies over which they have limited power. They say they do not have the power to stipulate which departments should stay open or which should close.

Government must respect the academic freedom of universities – however, government also has a responsibility, on behalf of the nation, to ensure that publicly funded educational institutions produce graduates with the balance of knowledge and skills the country needs. This means a role in ensuring that there is sufficient provision in all science subjects.

The government emphasises the importance of student choice and market trends and this has been used as a defence for several departmental closures. But this fails to understand that the government can "buy in" to the market strategically by stimulating the demand for the output of science departments.

There is also a current trend to try and measure just how many chemistry or physics students are "needed" by industry. This supposes that there is a simple relationship between the number of graduates and postgraduates produced and the needs of industry. It fails to recognise the importance of having people educated in science in all sectors of our society.

Today, vice chancellors are under considerable pressure and the blame for department closures cannot be placed at their doors alone. The RSC believes that it is the responsibility of the Government to work with universities to develop a national strategy for England and Wales.

So far the Westminster Government has reneged on its duty to protect the country's science base. It seems to expect Regional Development Agencies (RDAs) in England and Wales to do this on its behalf. RDAs were set up to drive regional economic development and whilst some have sought to address wider issues, they cannot act in place of government.


**Students demonstrate at the closure of Exeter Chemistry Department**

### Hub and spoke model

In April, the Commons Science and Technology Select committee published a report on strategic science provision in English universities which discussed the concept of setting up science cities and a 'hub and spoke' model.

This could mean that HEFCE would ensure a high level of research funding for at least one university chemistry department in every English region. Other universities in that region could specialise in areas such as teaching or knowledge transfer, according to their strengths and would receive extra funding related to these activities.

Undergraduates studying at one of these 'spoke' universities would be able to gain research experience at their local hub and in return some hub universities may want to contract out teaching to other institutions.

There are still many issues regarding the workability of such a proposal. However, the RSC welcomes the recognition that government must intervene to ensure science research and teaching has a future in all regions of the country. We will continue to make sure the voice of the chemistry community is heard in any future move towards this model.

### Erosion of the UKs Science and Technology base

In 2004 the UK Government set an R&D investment target of 2.5% GDP by 2014 in its 10 year science and innovation framework. This target assumed that UK-based industry increases its research investment by approximately 50% over the 10 year period.

Unfortunately, not just in chemistry, but in all sciences, the UK science and technology base is being eroded fast, with decreasing numbers of trained scientists and engineers each year. If this trend is not reversed it will make it impossible to deliver government R&D targets. The Government needs to intervene, starting with action on science department closures.

Yet, despite its talk of the importance of technology for future wealth creation, the Government currently seems either unwilling or incapable of intervening to help.

It is not acceptable for the government, of whatever political complexion, to 'wring its hands' and hide behind university autonomy whilst passing the buck to the Regional Development Agencies.

In the absence of a coherent, government-led national science, engineering and innovation strategy, the RSC will continue to campaign against all closures of science departments by every proper means available to us. We will fervently lobby government to take its responsibilities seriously.

**For more information on RSC strategy in this area, contact Professor Rodney Townsend (townsendr@rsc.org) or go to www.rsc.org/policy.**

# The Bologna Process

The creation of a new European Higher Education Area may have significant consequences for UK chemistry degrees. The RSC is calling on UK Universities to move the Bologna Process further up their agendas.

**A significant change is taking place in Higher Education (HE) across Europe, in the form of the Bologna Process. This has implications for degree courses in the chemical sciences in the UK. Unfortunately, at present there appears to be a lack of recognition among the UK academic community of the urgency to implement the alterations required, leaving us at risk of lagging behind other parts of Europe.**

This has prompted the RSC to take a lead role in raising awareness of the reform process with respect to the chemical sciences, and to deal with other issues surrounding the changes.

## What is the Bologna Process?

The Bologna Process aims to reform the Higher Education systems throughout Europe by introducing a common framework of readable and comparable degrees. The process would lead to the establishment of a European Higher Education Area (EHEA) by 2010. Its purpose is to strengthen recognition of qualifications across Europe to allow greater mobility of students. It also seeks to increase international competitiveness and so enhance the attractiveness of European HE worldwide.

So far, the Bologna Process has been carried forward via a series of biennial ministerial summits, attended by HE ministers from the ever-growing number of countries signed up to the associated Bologna Declaration. Decision-making is therefore an intergovernmental process, determined by the consensus reached by all the signatory countries involved. Although the European Commission funds a range of Bologna projects and is a voting member of the follow-up groups, it does not have authority to legislate on the Process, since competence for education lies with European Union (EU) member states.

## The story so far

In 1998 ministers from France, Germany, Italy and the UK met in Paris to sign the Sorbonne Declaration, signifying the first step in agreeing the need for comparable degrees and laying the foundations of the Bologna Process.

By 1999, the involvement had grown to 29 European countries. Ministers met in Bologna, Italy to agree the initial objectives (or 'action lines') of the Process and to sign a declaration (the Bologna Declaration) committing their countries to adopt a common structure of HE systems.

It was agreed that this common structure would be based on two main cycles: undergraduate ('first cycle') and postgraduate ('second cycle'). First degrees would last a minimum of three years and have relevance to the labour market, whilst second cycle degrees (following successful completion of the first) would comprise of further studies and research training.

It was also decided that a system of credits such as the European Credit Transfer System (ECTS) would be used to facilitate recognition of qualifications and assist student mobility throughout Europe. This system defines credits in terms of student contact hours and workload.

Since the initial declaration, ministerial summits have been held in Prague (2001), Berlin (2003) and most recently Bergen, Norway (2005). Each occasion has seen the welcoming of new signatory countries. 45 countries are now involved, the majority of which are EU member states.

## Impact for the UK and Chemistry

Although not strictly specified, a three cycle system comprising 3 years (Bachelors) plus 2 years (Masters) plus 3 years (PhD) is becoming widely accepted as the pattern for the Bologna Process.

First degrees in continental Europe traditionally last five years and many different award titles and grading systems exist, with little recognition between them. This means that significant restructuring is needed to bring courses into line with the Bologna first cycle requirements.

### The Action Lines

Ten main action lines have now been developed as the basis of the Bologna Process reforms:

- Adoption of a system of easily readable and comparable degrees in order to allow wider recognition of qualifications throughout Europe.
- Adoption of a system essentially based on two cycles of HE: undergraduate ('first cycle') and postgraduate ('second cycle').
- Use of a system of credits, such as the ECTS, as a transfer and accumulation system across Europe.
- Promotion of mobility of students, academics and administrative staff to spend time in the HE institutions of other EU countries and beyond.
- Promotion of European cooperation in quality assurance to facilitate comparison of qualifications and enhance international competitiveness. A European HE Qualifications Framework has been developed to facilitate this.
- Promotion of the European dimension in HE through joint degree programmes.
- Focus on lifelong learning.
- Involvement of HE institutions and students alike to form a diverse and adaptable European HE Area. Promotion of the attractiveness of the European HE area in order to maintain European students and scholars and attract the rest of the world.
- Inclusion of doctoral studies as a 'third cycle' in the Process, to build links between European HE and Research Areas.

**What impact will the Bologna Process have on future UK higher education qualification?**

### The MSci/MChem degree

A three year Bachelors degree is already the norm for most undergraduate level subjects in England, Wales and Northern Ireland (EWNI), meaning these courses are likely to be immediately accepted as first cycle qualifications. However, this is not the case for the chemical sciences, where enhanced four year MSci/MChem degrees have been offered since 1995. These courses have proved increasingly popular, with approximately 50% of all chemistry students choosing to study these programmes. Current academic opinion in the UK (excluding Scotland) is that the enhanced four-year MSci/MChem degrees produce graduates who are well-equipped to enter doctoral studies or life as a professional chemist. However, these integrated Masters courses do not offer an intermediate Bachelors qualification, as there is no clear distinction between first and second cycle level material. Therefore they run the risk of being regarded by other European countries as essentially a first cycle qualification, with no second cycle degree to follow. Add to this the fact that many European countries already operate extended two year Masters Programmes and that contact hours in UK universities are usually lower than in continental institutions, and the UK HE system is in danger of being left behind.

The problem will become more serious if second cycle qualifications become accepted as a prerequisite for entry into PhD studies or employment as a professional chemist outside the UK, as UK graduates will be competing with their European counterparts who may be regarded as better qualified.

### The next step for the UK

Since rapid progress has been made to restructure first cycle courses in other European countries, attentions are now turning to the second cycle, where chemistry in the UK faces its most serious problems. Similar efforts have not been made in the UK to adapt our degree programmes to fit the Bologna pattern. UK universities need to move the Bologna Process further up their agenda and be clearer about the relative purposes of their programmes at the Bachelors and Masters level, paying particular attention to the European HE Qualifications Framework.

In light of this urgency to prioritise, the RSC has produced a discussion document emphasising the need for greater differentiation between Bachelors and Masters level material. The paper contains suggestions for restructuring the Masters part of UK MSci/MChem courses and has been written to help guide chemistry departments within their institutions.

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