

Economic Development and Transport Committee

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Venue:	National Assembly for Wales, Cardiff Bay
Title:	Royal Society of Chemistry response to the to the National Assembly of for Wales Economic Development and Transport Committee Science Policy Review 2005

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Policy Consultation

Key Issues:

- The chemical sciences make a significant contribution to the UK economy
- The chemical sciences underpin key developments in medicine, material science, and IT.
- The right environment needs to be created to allow spin-out companies to flourish and benefit the Welsh economy.
- Proper regional provision of both research and teaching in chemistry must be maintained in Wales.
- University Chemistry Departments must be funded at levels that reflect true costs properly.

The RSC and the value of the chemical sciences

The Royal Society of Chemistry (RSC) is the largest organisation in Europe for advancing the chemical sciences. Supported by a worldwide network of members and an international publishing business, our

activities span education, conferences, science policy and the promotion of chemistry to the public. It is forging links with the Scottish Executive and Scottish Parliament Welsh Assembly Government and the National Assembly for Wales to offer assistance with decision making through events like Science and the Assembly and the appointment of a Welsh Assembly Consultant.

Chemical sciences provide critical core expertise for many scientific and technological developments and have made enormous contributions to social, economic and intellectual advances over the past century. For example, chemicals and pharmaceuticals are one of the UK's largest manufacturing industries that in 2002 had 230,000 direct employees, turnover of £50bn, £5bn trade surplus, capital expenditure of £3bn and R&D investment equivalent to 11% of sales. UK biotech is second only to the US, and creative chemical sciences have been a key driver for the foundation of many start-up companies. Indeed, the 2003 DTI scoreboard highlighted pharmaceuticals and biotech as two of the few internationally competitive sectors in the UK and the Prime Minister recognised the value of industries with high levels of investment in R&D in his Foreword to the DTI Innovation Report. Innovation in chemical sciences, in the form of successful exploitation of new ideas, impacts on most aspects of everyday life from new medicines to materials to foodstuffs to fuels and are essential to sustain the world, as we know it.

However, significant advances in science and engineering are still required to overcome the major challenges of the 21st Century as we strive to conquer disease, conserve natural resources, improve living standards and sustain society. The human genome has now been sequenced, and chemical sciences will be at the forefront in translating this priceless information into an understanding of the subtle molecular mechanisms that regulate complex biological pathways. Advances in understanding how molecular processes control fundamental cellular pathways will lead to new medicines that will treat, and possibly cure, many diseases. Better appreciation of natural phenomena coupled with novel synthetic procedures will improve our environment, conserve precious natural resources and generate new energy sources. Advanced materials and new insights into molecular processes will stimulate commercial exploitation of nanotechnologies with significant savings in energy, consumables and side products.

Solving these major scientific problems and improving the quality and sustainability of life critically depends on increased investment and innovation in chemical sciences in our schools, universities and industries. The chemical sciences are critical to solving these social and technical challenges. The following sections review the Scottish Executive efforts to date and propose what further measures are required to support a thriving chemical science base in Scotland.

Science and the Economy

Linking science to the economy and universities to businesses is an important part of government policy. We agree that we must utilise the skills and the ideas in our university labs to benefit our economy and jobs. The new Intermediate Technology Institutes, Proof of Concept, the Scottish Co-Investment Fund, the R&D Plus scheme, Knowledge Transfer Fund, SMART, SPUR, SEEKIT and SCORE schemes are

all welcome initiatives. However, Scotland Wales lags well behind the UK as a whole on Research and Development levels – and the UK lags well behind many other OECD countries. The Barcelona Call for Action requires investment in UK R&D to increase from the low level of 1.9 to 3% of GDP as part of EU strategy to become the most competitive and dynamic knowledge based economy in the world by 2010. However, it is disappointing that the UK Government has opted for a more conservative target of 2.5% by 2014. Reaching even 2.5% will require substantial increases in R&D funding by both government and business. New measures will be required to encourage business to invest more in R&D. If successful, however, this initiative would lead to an annual increase of 0.5% in GDP and 400,000 new jobs, and could stimulate inward investment in the high tech sector that would allow cutting edge science to add further value to both the UK and EU economies.

The Royal Society of Chemistry has conducted a comprehensive survey of UK universities chemical spin-outs. Our key recommendations were:

- The gap between the science base and business needs to be bridged to allow potentially commercial ideas to come to fruition. One way of bridging this gap is to staff university technology transfer offices with more individuals who have a high level of business acumen.
- A lack of entrepreneurial spirit should be addressed at school and university level to create an entrepreneurial culture which will subsequently spur innovation and business growth in Scotland Wales.
- The lack of experienced business management in spin-out companies significantly undermines spin-out activity. Schemes such as the secondment of industrial commercial managers into university spin-outs and mentoring by successful CEOs should be developed.
- The realistic provision of resources for IP filing and protection needs to be addressed. A university or university spin-out could not realistically finance the costs of the prosecution or defence of the broad portfolios of patents necessary to provide adequate commercial protection. To address this issue, the RSC recommends including the costs of patent filing under 'R&D' costs for the purposes of calculating a rebate under the R&D tax credit scheme.
- Access to more affordable business incubator facilities is essential. Many already exist but they are not affordable. These provide office space and skills services vital for nurturing spin-out growth. Public agencies in Scotland Wales should consider a co-ordinated approach to this issue.

University chemistry departments in ScotlandWales

The recent reduction in number of research active Chemistry Departments in Wales to two (Bangor and Cardiff) creates a situation of grave concern. The geographical structure of Wales demands the presence at the very least in both North and South, of a well funded, research and education science base. Policy or associated Sstrategy must assure this minimum provision if the infrastructure needed by modern

business and education is to be available to drive economic regeneration and upgrade, and for the aspirations of the population across Wales are to be realised. Reliance on provision driven by IT or other 'distribution technologies' (eg 'hub and spoke' or 'feeder course') is not a realistic option in the circumstances facing Wales.

The assessed research quality of chemistry in Wales has improved steadily, if unspectacularly, since 1992 (in the 2001 RAE exercise Cardiff was rated 4 while Bangor was 3a). Neither of these ratings is satisfactory if Wales is to compete effectively on the national and international stage. Ensuring that resources are available to facilitate the necessary up-rating of both North and South provision in RAE terms must be a core element of any Science Strategy. In this context, if significant improvement in the attractiveness of Welsh Chemistry Departments to staff, students and research sponsors (industrial and research councils) is to be achieved, there is a clear need for the apparent, and increasingly acknowledged, under-funding of HE Physical Science (chemistry, physics and engineering) to be addressed.

If the creation of educational and economic desert regions is to be avoided, it is vital that Wales does not sacrifice any more Departments of Physical Science. In the case of chemistry, the science policy and its associated strategy must commit to raising the attractiveness of Wales to inward investment by those aspects of the chemistry-based industries which are most appropriate for, and best suited to, the outstanding natural environment. The model of the Republic of Ireland has relevance in this context. Crucial features of any strategic science policy designed to elevate the science base in Wales to international competitiveness will include:

- significantly increased resource input into education and research in chemistry (and SET in general) to raise the attractiveness and competitiveness of the Welsh University Departments of Chemistry in the UK and wider international scientific arenas.
- assuring the presence of a high quality research and teaching University Chemistry Department in North and South Wales as an absolute minimum to provide the concentrations of world-class expertise needed to raise the profiles of the regions on the world stage, act as a primary attractor of new quality personnel into the region, and provide the educated workforce to sustain development in the business sector.
- establishment of essential elements of infrastructure (consultancy, service support, advanced equipment and resource sharing) needed to place a region naturally on the shortlist of new inward investors, particularly in the high tech sector.
- help for the development authority (WDA) to encourage the establishment of a quality business sector capable of providing high level, sustainable employment for graduates and non-graduates
- steps to encourage retention of the very best native talent and stem the haemorrhage of the most talented individuals from the regions.

It should be a matter of Policy that provision in Chemistry at a level capable of attracting the best students from all markets (home and abroad) and competing internationally is established and maintained in both North and South Wales.

The underlying funding arrangements for teaching and research at Welsh Universities do not reflect the real cost of doing chemistry.

Funding by formula has the undeniable advantage of transparency. However, its application in an unconstrained way can inhibit rather than encourage, and can lead to irreversible damage. Retention and development of a vibrant and diverse provision of Chemistry research and education in Wales, will require a system which recognises realistic funding needs, particularly in relation to the practical nature of Chemistry, to ensure that all remaining Welsh departments are, as a minimum requirement, competitive and attractive within and outside of Wales. With the loss of Swansea Chemistry, the sector in Wales (one research and teaching Department in North (Bangor) and one in South (Cardiff)) is now such that if Wales is to realise the economic benefits accruing from HE research and teaching in Chemistry, positive steps must be taken to secure that provision.

Chemical sciences underpin many other disciplines from pharmacy to environmental sciences and it is essential that research and teaching be maintained broadly across the UK HE institutions that offer courses in scientific subjects. The Lambert Report pointed out that concentrating research in a small number of universities would compromise technology transfer and academic collaborations with local business, with significant loss to local economies.

At a UK level the Royal Society of Chemistry wants the Government to invest £300 million (£90million for chemistry) to support the short term future of university science departments whilst more sustainable long term arrangements are put in place. The RSC is disappointed that the Government has so far refused to adopt this strategy, with the exception of ScotCHEM..

Careers

An independent report published in 2005 found that chemistry and physics graduates in the UK earn more than graduates from most other disciplines. This explodes the commonly-held view that studying science will not lead to financially rewarding careers. According to the PricewaterhouseCoopers report, a graduate in chemistry or physics earns around £187,000 more during their career than someone with A Levels but no degree, whereas history and English graduates increase their earnings by only about half as much. The work of Careers Scotland with the Space School and other initiatives are to be commended. It is essential, however, that careers advisers in schools are able to provide accurate information about subject choice in relation to opportunities for scientists. All science graduates, however, also have a responsibility to be ambassadors for science.

Diversity

Encouragement of women to study and remain in science is a key priority. As long ago as 1993 the Government White Paper "Realising our Potential" acknowledged that women are the UK's biggest single most under-valued and therefore under-used human resource.

The proportion of women in the undergraduate body has increased in the recent past and now stands at around 56 % but the proportion of women in the science undergraduate body lags some way behind. Within the physical sciences chemistry does well in recruiting women into undergraduate courses, with recent annual recruitment of attracting about 42 %.

The RSC's research suggests that one way to encourage women to remain in chemistry is to encourage good practice in the working environment. Good practice benefits both men and women but bad practice appears to discourage women more than men.

The RSC has worked with the Royal Society Athena Project to develop examples of good practice and we commend the work to the Assembly.

The Welsh Assembly should look to partner organisations working to encourage the participation of women in science.

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