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Sir Alan Langlands  
Chief Executive  
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31 May 2011  
Our ref: SecA/SIVs

Dear Sir Alan,

Thank you for your letter of 15 April outlining HEFCE's plans to review provisions for strategically important and vulnerable subjects. As I discussed with your colleagues on 14 March, the Society does not gather evidence on the flow of students through higher education, meaning we cannot provide any first hand information to supplement HESA statistics and the survey information which is already available to HEFCE.

Instead I will limit my remarks to the strategic importance of science, technology, engineering and mathematics (STEM) provision and evidence about future needs for trained scientists. We recognise that it is difficult to estimate the requirement for graduates with specific skills and from specific disciplines. Indeed, the risks associated with forecasting skills needs are well known. For example, many models for assessing demand are limited by the fact that the available evidence centres on demand in the recent past, rather than current or future demand. This being so, I would urge HEFCE to give thought to the way it gathers and treats evidence about the supply and demand for STEM qualified personnel and to explore different options for engaging STEM graduate employers.

The nature of demand also needs to be properly understood. For example, the quality and not just quantity of graduates should be considered. HEFCE might also seek to understand how demand is likely to change in the future; regular horizon scanning exercises might help the UK HE system to pre-empt demand for new kinds of knowledge and skills. Any such analysis would also benefit from a consideration of HE systems and demand trends in other countries, in order that the UK can position itself accordingly.

Notwithstanding these general remarks, there is compelling evidence of a steady and pressing demand for STEM graduates from employers. Numerous reports have identified employers' demand for STEM graduates, and in particular a broad requirement for numeracy aligned with specific technical skills. The most recent CBI survey of graduate employers<sup>1</sup> is a good illustration. Almost half of all respondents (43%) want action to raise the numbers and quality of STEM graduates. Close to two thirds of respondents in manufacturing

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<sup>1</sup> <http://www.cbi.org.uk/>

sectors (63%), and an even higher proportion of respondents in science, engineering and IT sectors (84%), are calling on the government to act.

The Society has also warned that the maintenance of a rich, sustainable and internationally competitive science base demands a certain quantity of PhD-qualified entrants. Here too, quality must not be overlooked.<sup>2</sup>

The clear signals that STEM higher education is valued across industry, both manufacturing and service, as well as in the necessity to produce the next generation of teachers and leading researchers, highlights a continued need for the kind of response that HEFCE has developed - with reported success.

The Government's continued emphasis against overly interventionist action in this area is correct. The Royal Society has said that the constantly changing nature of the workplace means that it is not necessary for UK HEIs to produce specific numbers of graduates in each STEM area; disciplinary quotas and a strict manpower planning system are neither necessary nor desirable. Indeed there is often considerable movement between specialisms over the course of a person's career. Instead, a key requirement is for a HE system that produces graduates who possess strong core scientific skills, and who can be flexible over the course of their working lives. The HE experience should be the essential basis and a start to lifelong learning, equipping graduates with the skills to adapt and flourish in changing circumstances.

Our work shows that employers of STEM graduates have always looked for technical knowledge and intellectual capability, but there has been an increased emphasis in recent years on combining subject expertise with good interpersonal and workplace skills.<sup>3</sup> Also deemed important are well-honed problem solving skills and the ability to undertake rigorous logical analysis – skills gained from exposure to, and familiarity with, the deductive process, theoretical modelling, and the gathering and use of experimental evidence. Physics, chemistry, engineering and mathematics all provide this critical grounding.

The benefits of these kinds of skills and knowledge extend far beyond high-technology sectors. Analytical and problem solving skills are ever more important in insurance, business services, retail and the creative industries.<sup>4</sup> As scientifically trained people take many different paths in the economy, the ripples of investments in science spread far and wide. This ready transferability of core skills is, in part, what makes these subjects strategically important.

Your letter made repeated reference to public interest, and I discussed one aspect of this notion with your colleagues: when facing cuts, it might make sense for universities to concentrate resources into fewer subjects. But it is also in the public interest to give every student equal opportunity to study a range of subjects. With higher fees, students are likely to be less mobile in choosing their higher education. So there is a potential tension between the public value of specialist institutions and the needs of the next generation of students.

In short, there is a risk of STEM provision across the sector becoming narrower. This might be further compounded by tighter disciplinary focus within undergraduate STEM courses in UK universities. This narrowing could potentially disadvantage students in future, given the obvious value of widely transferable skills and knowledge.

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<sup>2</sup> <http://royalsociety.org/The-scientific-century/>

<sup>3</sup> <http://royalsociety.org/A-degree-of-concern-First-degrees-in-science-technology-and-mathematics/>

<sup>4</sup> <http://royalsociety.org/Hidden-wealth-The-contribution-of-science-to-service-sector-innovation/>

As you point out, HEFCE will intervene in cases where the student-led system fails to achieve the public interest in terms of subject provision. (It would be helpful if HEFCE could elaborate on how it will assess the public interest, particularly in relation to subjects that are protected). One challenge which might concern HEFCE is that the student-led system is unlikely to be forward looking enough to anticipate emerging or changing needs for knowledge and skills. That is to say, the market-led approach will naturally focus on currently perceived demands, opportunities and challenges, rather than long term capabilities; this could perpetuate or even increase the vulnerability of certain subjects. In this sense, the market-led system is itself a risk factor. One objective for the SIVs programme is to help the HE sector avoid becoming fixated on short-term requirements and retain the competence and capacity in core science subjects needed to respond to unforeseen future challenges and also wholly new opportunities.

One important element of an effective 'early warning system' will be a better understanding of the flow of prospective STEM undergraduates. In February 2011 the Society published a report, entitled "*Preparing for the transfer from school and college science and mathematics education to UK STEM higher education*"<sup>5</sup>, which highlighted worryingly low levels of participation in science and mathematics by 16-19 year olds in all parts of the UK except Scotland. This means that the 'pool' of students able to proceed to study STEM subjects at degree level is too small to fulfil the needs of UK employers. In England, Wales and Northern Ireland in 2009, only 28/27/37% respectively of all A-level students achieved at least one mainstream science qualification, compared with 50% of students in Scotland. This is one immediate issue that HEFCE should be concerned with.

The recent evaluation of the SIVs programme shows that to date HEFCE's stewardship of these disciplines has been effective. Nonetheless, this review is both timely and welcome, given the significant changes that are taking place in the sector and we are pleased to be able to support HEFCE in this important work. I would like to nominate Laura Dawson and/or Libby Steele to represent the Society at future meetings.

Yours,



Professor John Pethica

Cc Dr James Wilsdon, Royal Society

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<sup>5</sup> <http://royalsociety.org/state-nation-increasing-size-pool/>

