THE BALANCED ECONOMY – THE NEED FOR STEM CAPABILITIES

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This article is written on the premise that science and technology are the foundations upon which growth and the modern economies are built. As such, there needs to be a much greater emphasis in all communications of the benefits that science has given society and the role of scientists in wealth creation. People take the advances made by science and technology for granted whether they are in telecommunications, healthcare, transport, food supply, or IT, etc. Each and every one of these will be driven by science, technology, engineering and maths (STEM). Yet much of society seems to place little or no value on the role of scientists preferring the cult of the celebrity be it sport, the arts, TV, music or film (or even politics).

For many years concern has been raised by industry about the number and quality of young people coming forward for careers in STEM. This can be expressed as part of the wider issues of skills which many trace back to Jim Callaghan's Ruskin College speech in 1976. More recently we have specific reviews for STEM such as that undertaken by Sir Gareth Roberts[1] or from SEMTA[2]; the latter states *"In terms of the quantity of supply, the falling interest of young people in taking STEM courses is a serious strategic challenge, both for the UK…."* [3] The Dyson Review [4], which will underpin the Coalition's approach to ensuring the UK has a high tech future, reiterates many of these concerns identifying several issues including culture – the lack of esteem of scientists and engineers, education – getting young people excited about science and engineering, our inability to exploit knowledge and an alarming shortage of UK students taking engineering and technology postgraduate courses.

Actions in the past have often focussed on increasing the take up of STEM in core primary and secondary curriculum in schools; however, there is a need to convert enthusiastic youngsters into mature, effective professional scientists and engineers. These are the people who will drive the generation of new knowledge which will underpin innovation and the country's production of new products. It is the dearth of these people that now confronts industry and the country with the majority of the most able students deserting STEM careers.

This threat is now compounded by several factors: firstly, the major expansion of science education in other countries, particularly in India and China; secondly, the willingness of global companies to move R&D facilities to regions and countries that have the available talent pool; and thirdly, the distorting effects of salaries and bonuses in other sectors of the economy especially financial services which attracts talent from careers in STEM.

The remainder of this article focuses on the careers paths and career prospects for the most able young people; those who will be leaders in their field no matter what profession they follow. Equally all industries and sectors will need their talents if they are to succeed in the modern global economy. The pathway chosen for an individual will be decided on a balance of financial reward, recognition, personal interests and ambition tempered by opportunity. Let's examine the three possible choices presented to a 'first class graduate' starting out on their career: a) management trainee into a blue chip multinational company; b) fast stream entry into the civil service; and c) a research career begun with a PhD programme at one of our premiere universities.

The graduate management trainee in a blue chip company [5] is enticed with statements such as *"entering their future leaders programme"* and *"We offer world-class development opportunities in a fast-paced,*

challenging work environment". These programmes abut the graduates to a range of opportunities in which to shine. The outcomes for the many will be, by their late 20s, management of a significant function with the rewards and lifestyle to match. For those that remain within the company or similar business environment the possibility of the path to senior director roles and above is a realistic expectation,

The fast stream career in HM Civil Service[6] has similar early foundations with a programme that *"will enable you to develop quickly and move posts more frequently than you would ordinarily expect."* Obviously prospects for any individual will depend on talent but there is the expectation for the best that a grade 7 appointment would be possible by their late 20s and promotion to the senior civil service a realistic expectation. The fast stream is available for specialist science graduates both in the MOD and other departments; however, these roles are often primarily managing science and procurement rather than 'doing' science.

The route for a professional scientist will almost always involve the training role as well; in this case it is called a PhD programme and this is essential to a future as a 'world class' researcher.[7] The days when young people undertook a PhD on a meagre grant have thankfully now gone, although the salary or stipend is still significantly below that of the fast stream or graduate traineeship in industry. However, for the scientist's career this is only at the first step and is followed by one or two post-doc positions. The post doc is only obtaining their first substantive post in universities, industry or an executive agency when the management trainee or fast streamer is well established in their career. Examination of the appointments pages of New Scientist or other sources of vacancies often show extremely poor rewards given the length of training and experience of the post doc. Certainly there is no significant campaign by companies to recruit world class young researchers comparable to that for MBAs where graduates from the world's top business schools can expect salaries in excess of £75,000[8]; a sum beyond the dreams of all post docs, essentially, at the same stage of their careers.

The early careers of scientists in universities have been examined and severe shortcomings reported[9] including high levels of dissatisfaction and poor salaries. Perhaps the most damning statement from this report is summed up in the following statement *"We are concerned that the feelings of dissatisfaction with scientific careers are filtering into the wider science base and possibly into the education system as a whole. Post-doctoral researchers are often the first point of contact for PhD students and undergraduates following project-based courses. Even schools may feel the effects, as children assess the attractiveness of future careers from advisors and others when choosing which 'A' level options and degree courses to follow. People working at the frontiers of discovery are ambassadors for science whatever their eventual careers."* This undermines much of the good work that is happening in schools to improve the take up of science education.

Many science based companies, and in earlier times, the civil service, professed to have parallel career structures and rewards for the specialist and general managers. The custom, however, is more honour'd in the breach than observance for several reasons. Firstly, as expressed above, the starting points tend to be different; secondly, criteria for establishing level of a role for a manager tends to be focussed on tangible measures such as budget, number of reports and financial authority, etc. Whilst for the specialist measures associated with level are more intangible such as quality or reputation; thirdly managers performance criteria have measures such as keeping within a budgets which limits the progress of team members (i.e. the specialist they are managing); fourthly talent management programmes, common in larger organisations, are primarily the preserve of the manager, not the specialist scientist; and lastly, the ethos of senior levels of leadership and management comes from the paradigm that scientist can only do science – management and leadership are the preserve of the generalist or those with a background of law, accountancy and marketing, etc.

There are no simple solutions and, certainly, no quick ones. We must break down the attitudes implicit in the recent consultation – A Vision for Science and Society – that the public view of science is focussed on the negative and that scientists are somehow separate from the rest of society. If there aren't significant changes, then the UK science base will enter a downward spiral and the CP Snow's 'two cultures' will be confirmed. If change is to occur we need concerted effort by employers of science graduates (which includes government and other public bodies) to make career choices to scientists as attractive, if not more so, than other professions. In particular they need to:

- demonstrate the value they give to highly skilled scientists by giving salaries, standing and career structures that match generic managers at the same state of the careers;
- identify role models, materials and (statistical) data that give positive image to the science professions;
- find ways (prizes only seem to have an impact within the specialist community) to publicly recognise the work and contribution of young scientists early in the careers rather than at retirement.

REFERENCES

1 Sir Gareth Roberts (2002) SET for Success

2 SEMTA – The sector skills council for Science, engineering and manufacturing technologies

3 SEMTA (2008) Evidence to the DIUS Consultation – The demand for STEM skills

4 Sir James Dyson (2010) Ingenious Britain – Making the UK the leading high tech exporter in Europe

5 Taken from the recruitment pages of a major multinational.

6 The Civil Service recruitment web site

7 Being 'world class' is essential for reputation and funding within the present UK system.

8 Source - FT Global MBA rankings – top 5 UK business schools

9 Council for Science and Technology (2007) – Pathways to the future: the early career of researchers in the UK

10 A vision for Science and Society (2008) A consultation on developing a new strategy for the UK DUIS