Meeting of the Parliamentary & Scientific Committee on Tuesday 23rd April

THE UK SCIENCE WORKFORCE

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I am delighted to contribute to your discussions on UK science skills. This is the Science Council's 10th anniversary year and it now has 42 member bodies from across science and its applications, with over 400,000 individual scientist members. We provide three levels of professional registration – Chartered Scientist which started in 2004, and Registered Scientist and Registered Science Technician which were launched last year.

. . . policy issues affecting the science community . . .

The Science Council has three aims: to serve society and the economy by enhancing the professionalism of the scientific workforce and building trust and confidence in science; to provide a voice on policy issues affecting the science community, fostering debate and the exchange of ideas; and to support member bodies to be more effective in meeting the needs of the science community.

In furthering our work with the science workforce, working with our member bodies we have asked a series of questions intended to help understand how to ensure there are sufficient workers with the right skills to drive forward science knowledge and application in an innovative economy.

- Is high quality labour market information and intelligence (LMI) available to inform employers, government, young people, and education providers?
- Which employers are currently driving demand for science skills and how is this changing?
- What do we understand about the current and future science workforce?
- How do people acquire and maintain science skills?
- All forecasts of demands are upwards. How will policies for investment in the UK science base serve to develop the skills as well as knowledge needs of different types of science and different types of scientist?

We found that the labour market intelligence and information we were looking for did not exist – and in particular there was a lack of LMI suitable for young people and education providers on the demand for STEM skills, especially at a regional level. We also found that existing skills data failed to capture what was driving the demand for science graduates in particular, although it was more straightforward to understand employment trends in STEM sectors. There were also inconsistencies to address: for example, several employer-led reports indicated shortages of STEM graduates which seemed incompatible with the headline data telling us that 51% or more of STEM graduates did not enter STEM employment. There were also other claims that an oversupply of STEM graduates meant that many were not entering graduate jobs.

. . . existing skills data failed to capture . . .

I will address a few of these headlines. The first is STEM graduate employment. There are some 195,000 STEM graduates annually in the UK and yet there are reported shortages in every area. What are the reasons for that? Is the UK turning out the right type of STEM graduates for the employers or are some science graduates lacking in the skills needed for science employment? Are the shortages really the result of large numbers of STEM graduates, and in particular engineering graduates, going to highly paid jobs in the City? Is there something unattractive about the STEM employment sectors?

	Scientific Occupation	Finance (i)	Finance (ii)	Teaching	Other
Medicine and Dentistry	95	1	0	0	4
Subjects Allied to Medicine	80	1	1	3	15
Biological Sciences	22	2	3	21	52
Biology	31	0	3	14	49
Sports Science	1	4	2	31	62
Psychology	23	2	5	20	50
Veterinary and Agriculture	28	2	3	8	59
Physical Sciences	30	4	4	14	48
Chemistry	36	5	1	14	44
Physics	44	10	17	18	21
Forensic and Archaeological Science	60	0	0	0	40
Mathematical Sciences	25	20	13	18	24
Computer Sciences	47	4	9	6	34
Engineering and Technology	59	3	3	3	32
Engineering	61	2	3	3	31
Technology	38	6	4	0	52
Architecture, Building and Planning	53	0	1	0	46
STEM	49	4	4	9	34
Non-STEM	5	7	7	18	63
TOTAL	24	5	6	14	51

BIS, 2009 'Increasing the supply of STEM Graduates or reducing the leakage?', HESA Destination of leavers

Do we have sufficient understanding of STEM employment and science occupations? Is there an underlying issue about diversity and progression through to science professions?

I think these data indicate we need to re-think some of those claims.

Taking Sports Science as an example, the data show just 1% of graduates in STEM occupations, with 31% going into teaching. But we know from other research that Sports Science[1] graduates often aim for occupations that are not classified as STEM occupations or classified STEM sectors: for example sports management, sports journalism or the leisure industry.

Just 8% of STEM graduates go into the City or high level financial services (Finance 1 in the chart), and other sectors that are finance or linked to finance such as insurance (Finance 2 in the chart). For engineering the number is 5% total in the combined finance sectors and just 3% in the 'City' category. Some of these jobs will be clearly STEM based roles – systems modelling for example, or risk assessment, actuarial analysis, business analysis, but overall the proportion leaving for finance is not nearly as significant as people suggest and in my view the sector should move on from this myth. It is also worth noting that a significant proportion of STEM graduates go into teaching, particularly psychology, maths and physics but only a very small proportion of engineering graduates (just 3%) and in this study, no Technology graduates.

A BIS research paper, *STEM Graduates in Non-STEM Jobs*[2], found that the majority of final-year students reported that they wanted to pursue a career 'related' to their degree subject but this did not necessarily mean looking at the degree as a vocational route. The choice to seek out a potentially more varied occupation was a positive one and the potential and reputation of graduate schemes as 'more mainstream' was also a factor.

. . . one third of the science workforce who are non-graduates . . .

This study also reported difficulties in defining STEM occupations and STEM employment sectors.

Fig 2 is an illustration of what the 'food sector' might look like:

This illustrates the diversity and range of employers and career options. There will be scientists working at different levels in every part of this environment and it is clear that there will be many occupations to identify. For anyone seeking out careers, this LMI is complex and hard to follow but it also illustrates how an individual's role might evolve as they move around different employment sub-sectors within the food landscape.

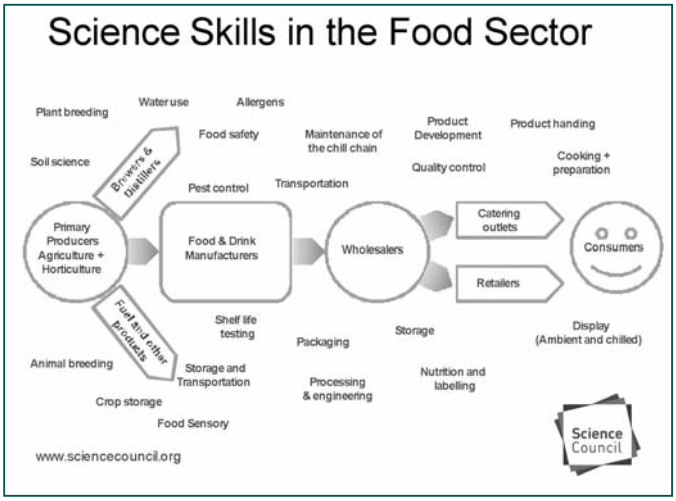

Fig 2

Our next stage was to identify and explore the different types of science related roles. A science professional may have a career as a scientist, in science or from science. Working as a scientist they will be in a STEM environment and the role will be clearly recognised as a science role. Working 'in' science they may be in a STEM sector but will have moved away from direct day to day science and be influencing, supporting, promoting, managing, leading and shaping. Scientists also move into wider employment where their science knowledge and wider skills are also valued and these are 'from' science.

Even within these broad categories the roles differ. To illustrate this I have identified 10 types of scientist.

These are:

1. Explorer
2. Investigator
3. Developer/Translational
4. Service provider/operational
5. Monitor/regulator
6. Entrepreneur
7. Communicator
8. Teacher
9. Business/Marketing
10. Policy maker

The skills required for each of these roles is very different and using this analysis we can see that demand for STEM skills comes from the economy as a whole rather than just the classically understood STEM employment sectors.

In March 2011 the Science Council published its first study of the UK Current and Future

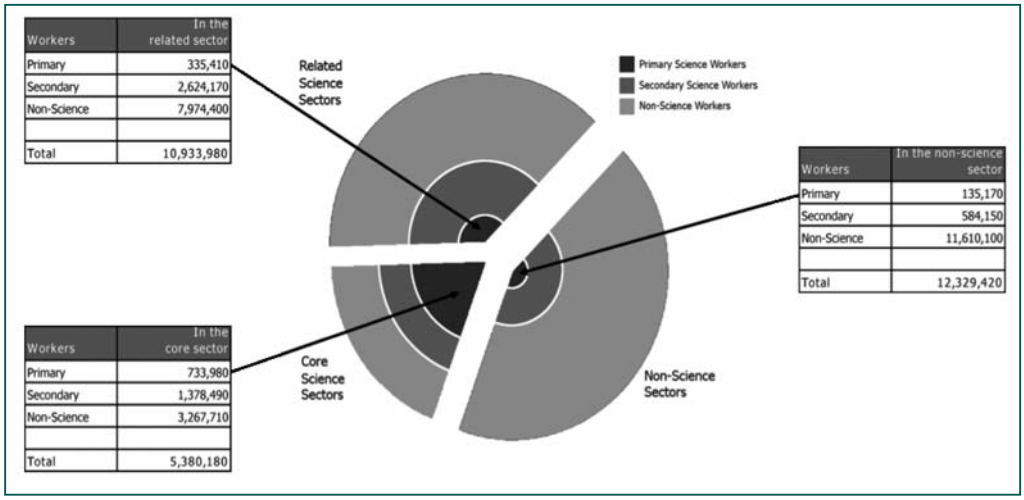

Fig 3

Science Workforce[3]. Building on the understanding we had gained that the science workforce transcends traditional occupation and industry classifications, this study looked at the entire UK workforce. We also wanted to capture the multi-disciplinarity of individuals, employment sectors and new professions and sectors.

. . . science knowledge and wider skills are also valued . . .

Industry/occupation matrices were used to produce definition of employment sectors as core, related and non-science sectors, and workers as primary, secondary and non-science workers, see Fig 3.

This study showed that:

- **20%** of the workforce is employed in science roles, amounting to **5.8 million people** of which **1.2m** were primary science workers and **4.6m** secondary science workers. This is expected to rise to 7.1million in 2030.
- The Health and Education sectors employ 60% of the science workforce and the remaining 40% of the science workforce is distributed across a range of sectors.

The science workforce in academia and research has traditionally been the most visible and vocal, and they feature strongly in both the policy and careers landscapes. However, our data identified this group as under 250,000 (32,000 primary science workers in academia and a further 72,000 in education with 130,000 primary and secondary science workers in R&D) with a relatively high percentage being postgraduates. The more significant finding is the one third of the science workforce who are non-graduates.

Regional science employment distribution is very similar to total economy averages with 37.4% (2.1m) located in the East, the South East and London.

Gender diversity remains an issue in many areas but overall the primary workforce 60/40 male/female similar to UK working population (54/46) with some sectors close to a 50/50 gender distribution. However, there is a higher proportion of females in secondary science roles, particularly in the public sectors and in some science employment sectors, such as ICT, we found extreme gender imbalance with 91% reported as male. Of the 720,000 science workers (primary and secondary) in non-science sectors we also found an extreme gender balance with 73% male, where the profile is for higher pay and older workers.

One of the most important features we identified was that there is a significant number of non-graduates in the science workforce. Using data on the highest qualification the science workforce is shaped as follows: 34% with pre-graduate qualifications, 32% with graduate qualifications and 27% with postgraduate qualifications. The comparison for the whole economy would be 61:15:5. The indications are that the role of graduates and non-graduates in the science workforce will continue to grow.

From the research the Science Council has identified the following policy priorities for the future:

- We need to develop greater diversity in the science workforce;
- There is a need to invest in, develop and support non-graduate pathways into science careers, including provision of apprenticeships, science focused applied and vocational qualifications for post-16;
- There needs to be a review of HE provision to ensure that the STEM degrees meet the needs of both the primary and secondary science workforce;
- The UK needs to address the sharp decline in the number of taught specialist masters degrees available.

REFERENCES

1 BIS Research Paper No 30, *STEM Graduates in Non STEM Jobs*, March 2011

2 BIS Research Paper No 30, *STEM Graduates in Non STEM Jobs*, March 2011

3 http://www.sciencecouncil.org/content/science-workforce

INNOVATION IS GREAT BETWEEN THE UK AND INDIA

Tom Wells, Deputy Head, UK Science & Innovation Network, India

Innovation is an issue of growing importance for bilateral collaboration between the UK and India. This has been the case for a while, but was formalised as a top priority in March 2012 when the Science Ministers of both countries met for the UK-India Science & Innovation Council.

This priority, alongside work to promote UK-India research collaboration, was given the ultimate endorsement at the UK-India Summit in February this year. The British and Indian Prime Ministers issued a declaration in which they "welcomed the rapid expansion of India-UK research and development cooperation, which is helping to generate and develop high quality, high impact

. . . renewed focus by governments . . .