The Royal Society Study: Science Higher Education in 2015 and Beyond

Response from the Wellcome Trust

July 2006

Introduction

1. The Wellcome Trust is pleased to respond to the Royal Society's study on Science Higher Education in 2015 and beyond. We welcome the Royal Society's inquiry into the ability of UK higher education to produce the Science, Technology and Mathematics (STM) graduates necessary to meet the needs of the economy and society.

2. The Trust predominantly funds research in the biomedical sciences. Its mission is to foster and promote research with the aim of improving human and animal health. Our response focuses on the issues most relevant to the Trust. The first issue addressed is the need to maintain a high-quality, competitive biomedical research base in the UK. Achieving this goal requires science education culminating in specialised PhD training and flexible career development opportunities for scientists. The second issue addressed is the need to encourage productive communication between scientists and the public. Achieving this goal requires scientists to have the necessary communication skills to engage with non-specialist members of the public.

Ensuring a competitive research base in the UK

3. People are at the heart of developing a robust research base. Trainee scientists should have a sound and broad-ranging knowledge of scientific issues and techniques, including those outside their specific areas of expertise. They should also have access to and competence with state-of-the-art scientific technology. In order for the UK to maintain a healthy and competitive biomedical research base, it is imperative both that the strength of biology is maintained and that the chemistry, physics and mathematical disciplines are robust.

4. Flexibility and international mobility for researchers will also be crucial to maintaining a strong science base in the UK. Opportunities to collaborate and learn new skills must be available at all stages of career development. We are presently developing new career schemes to address these issues, details of which will be available by autumn 2006.

5. Between 1998 and 2001, the Trust conducted a series of studies on the outcomes of its funded PhD programmes. Surveying students, supervisors, and PhD graduates who had recently begun careers, these studies generated useful insights into UK PhD training and results remain relevant today.

6. Many respondents to the Trust's survey of PhD supervisors (*The Supervisor Perspective*)[1] expressed dissatisfaction with the usual three-year studentships. This concern was related to a belief that the nature of experimental research is unsuited to uniform or rigid timescales. Furthermore, some felt that many UK students finish their first degree with little or no relevant individual practical research experience, and are therefore unlikely to be able to complete a substantial piece of high-quality individual research within three years.

[1] Review of Wellcome Trust PhD Research Training: The Supervisor Perspective (2001), http://www.wellcome.ac.uk/doc_WTD003205.html

7. The Trust currently supports 14 thematic Four-year PhD Studentship programmes. Under these programmes, the first year is structured by the University and allows the students to get involved in a series of research projects and/or participate in a number of taught courses. The aim of this foundation year is to increase students' technical research skills, to broaden their understanding of the areas of science covered by the training programme, and to give them a flavour of different laboratories. It is also hoped that students will be able to make a more informed choice about the PhD research they will pursue – and the supervisor with whom they will be working.

8. The Trust considers four years to be an appropriate length for a PhD, as it allows time for broad training and the development of general skills, but the Trust does not support extending the PhD beyond four years.

9. PhD science training must remain an attractive option to the brightest students. In the Trust study, *The Supervisor's Perspective*, almost half of supervisors surveyed felt that it was more difficult to recruit PhD students than it had been five years previously. The main reasons given were that students considered a scientific career to be financially unattractive and long-term career prospects for PhD scientists to be poor.

10. The Trust's study of the subsequent careers of its PhD students (*Career Paths of a 1988-1990 Prize Student Cohort*)[2] illustrated a considerable diversity of career destinations and identified important career development issues both for the Trust and for the wider academic community. Substantial numbers of the Trust PhD students remained in research almost a decade later, either in the academic or pharmaceutical/ biotechnology sector. However, almost one-third of a more recent cohort of students (*The Student Perspective*)[3] thought they were unlikely to remain in scientific research, suggesting recent emergence of disillusionment about the value of a research career, particularly in an academic setting.

11. Improving academic salaries and career structure could improve UK PhD student recruitment and retention. PhD student recruitment could also be facilitated by improving science education in schools and improving the profile of scientists and science in general. To these ends, the Trust welcomes the series of measures put in place by the Government following publication of *SET for success: The supply of people with science, technology, engineering and mathematics skills*, and further proposals outlined in the *Science and Innovation Investment Framework 2004-2014* and its follow-up document, *Next Steps*. It is vital that these measures are followed through and their impact on the UK science base monitored and assessed.

12. In order to enhance career advice available for researchers, the Trust, in partnership with RCUK Research Careers and Diversity Unit and the Royal Society, is taking forward a project to develop a web-based research career mapping tool. The tool will provide information on: the range of jobs on offer; skills and qualities needed; how to demonstrate one's qualifications; and what candidates need to do in order to be effective in their jobs.

13. The Science Council project 'Careers from Science,' will target younger students aged 11-19 and provide information on the benefits of studying science and technology. Efforts such as this could help improve recruitment of students to science higher education.

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[2] Review of Wellcome Trust PhD Research Training: Career Paths of a 1988 – 1990 Prize Student Cohort (2000), http://www.wellcome.ac.uk/doc_WTD003200.html
[3] Review of Wellcome Trust PhD Research Training: The Student Perspective (2000), http://www.wellcome.ac.uk/doc_WTD003203.html

14. In order to ensure high quality science education in schools, it is necessary to ensure that the quality of teaching of science subjects is high. Doing so relies on improving the recruitment and retention of science teachers, and supporting their continued professional development (CPD). In 2005, the Wellcome Trust commissioned a survey of teachers and managers in state maintained schools in England to determine teachers' views about CPD. The resulting report[4] revealed strong support for CPD, particularly to update subject knowledge. The report highlighted that half of all secondary school science teachers have had no subject related CPD in the past five years.

15. The Science Learning Centres, a £51 million partnership between DfES and the Wellcome Trust, are now in place to deliver high quality CPD for science teachers. Nine regional centres, and one National Centre based in York, provide a network for professional development in science teaching, supporting science teachers and technicians to develop new skills and experiment with innovative techniques. Science education in schools also depends on an appropriate curriculum and resources.

Encouraging productive communication between scientists and the public

16. The skills that researchers require whilst training need to be thought of in the broader context of their value to society at large. There is an increasing need for scientists to engage in dialogue with the public. We are therefore pleased to have supported a recent study on factors affecting communication by scientists and engineers, together with the Royal Society and Research Councils UK. One of the recommendations in the resulting report, *Survey of factors affecting science communication by scientists and engineers*[5], is to encourage more young scientists to get involved with public engagement activities. The report endorses training of scientists on public engagement at undergraduate and postgraduate levels.

17. In one example of public engagement training, the National Science Learning Centre recently held a two-day course to help scientists develop skills and experience for working with school children. On the first day, the scientists learned about the curriculum and different didactic models, and then developed their own presentations. On the second day they worked with small groups of young people to practice their presentations and receive feedback from the children on how they could improve.

18. The Trust believes that communication skills must be recognised as an integral part of scientific training. This type of training should include an appreciation of how non-scientists view science, particularly their concerns about it, and examinations of science on society and its individuals. The Trust is currently involved in discussions with the Higher Education Funding Council for England (HEFCE) and other research funders to consider whether there are ways in which universities and colleges can be supported to recognise and reward public engagement activities more effectively.

[4] Wellcome Trust (2006) *Believers, seekers and sceptics: what teachers think about continuing professional development*
[5] Survey of factors affecting science communication by scientists and engineers (2006), http://www.royalsoc.ac.uk/page.asp?id=3180