

*What are the gaps in the capability of our people to develop science and deliver innovation in the UK and how should those gaps be addressed?*

The RAS welcomes the examples of ongoing political commitment to public engagement activity from BIS and from the Science and Technology Facilities Council that are set out in the online questionnaire.

We are also engaged with organisations like STEMNET, have in the past been represented at the Big Bang Fair and recently launched a major (£1m) public engagement programme to commemorate our 200th anniversary. Measures like this help to encourage young people in particular to consider careers in science and engineering and astronomy is recognised as a 'STEM attractor' that inspires interest in science in general.

In contrast to these positive messages is the reduction in funding for teaching of high cost STEM subjects in (English) universities at undergraduate level (See e.g. <http://www.hefce.ac.uk/news/newsarchive/2014/news86801.html>). Set alongside the drive to expand places on degree programmes, this is reducing the quality of the intellectual and practical training young people receive and increasing the financial risk to and stress on university STEM departments.

Another issue is the taught MSc courses that can provide routes into employment in areas like geophysics, where private sector companies report difficulties in recruiting qualified staff. Students on these courses are not eligible for support from the Student Loans Company, so must have significant private means or apply for career and personal development loans from high street banks on far less generous terms than those available to undergraduates.

If students are to have the right set of skills for employment in science and industry, they need properly resourced post-compulsory education and these issues need to be addressed.

*How can we strike the right balance between our investment in curiosity-driven research and investment in solving societal challenges and other forms of applied research? And how can we encourage the interaction between these?*

The Royal Astronomical Society represents astronomers and space scientists, most of whom work in curiosity-driven research, and solid-Earth geophysicists, whose research usually has more immediate applications. Nonetheless we have gathered a good deal of evidence that investment in both of these areas has significant benefits across wider society.

See for example our case studies in 'Beyond the Stars: Why Astronomy Matters' and 'Going Underground: Why Geophysics Matters' at <http://www.ras.org.uk/publications/other-publications>. Both publications feature examples of individuals and small businesses that attribute their success to unorthodox and unexpected uses of astronomy and geophysics that would not have been possible without initial funding for 'blue skies' projects. These cases illustrate the widespread enthusiasm for transferring expertise and work from academia to industry.

One of the best examples is the space industry, which employs many PhD graduates in RAS supported science. Their creativity helps support an industry with a turnover of £9 billion that employs nearly 30,000 people (figures from the UK Space Agency).

Another long running issue for consideration is the relative level of R&D funding in the UK, which is consistently low compared with other G7 (and EU) countries. If the UK increased public investment in this area to be comparable to that of our competitors, we might be able to move beyond the debate on the balance between curiosity-driven and applied research.

*How can we support cross fertilisation of ideas, for example by encouraging interdisciplinary research and innovation? What are the risks and benefits of doing this?*

Like other sciences, astronomy has related interdisciplinary activity, much of it relatively new. Examples are astrobiology, astrochemistry, astroparticle physics and space weather. The UK excels in these areas, which are also some of the most inspiring for the wider public.

Undergraduate teaching is one of the most important roles for academic staff in universities, where a large proportion of publicly funded research takes place. RAS Fellows however report that the decline in HEFCE teaching funding is resulting in significantly higher teaching loads. When these are combined with the variety of other duties they are expected to perform, much less time is available to carry out the research, interdisciplinary or otherwise, that can lead to innovative solutions with commercial applications.

Put simply, a restoration of adequate teaching funding and a sensible balance of duties will allow academics to work on their research programmes, collaborate more effectively with their peers and support knowledge transfer to bring ideas from laboratories to the marketplace.

*Please feel free to add any additional comment or information that you consider important for the formulation of the Science and Innovation Strategy.*

The Royal Astronomical Society welcomes the opportunity to give input to this consultation. We would urge BIS to continue to work with us and similar learned societies on future work of this type, and to make use of the independent voice we provide for scientists across the UK.