Impact on the national interest

1. Where has EU action had a **positive impact** for the UK on research, technological development, innovation or space? What evidence is there for this? Has EU action encouraged national action in any areas?

   Astronomy and space science have benefitted enormously from both EU funding streams and international EU-fostered collaboration. There is general agreement in these communities that the UK would not be as effective in these 'big sciences', where team building is important, if we did not have access to the EU R&D programmes.

   Since 1984 the Framework Programmes have supported programmes in research and innovation that cover at least three EU member states, and through fostering networks for research collaboration and training of young scientists. The specific commitment to space in the Horizon 2020 framework programme should provide further benefits, particularly for science attached to the two current priority programmes, Galileo and Copernicus (formerly GMES, Global Monitoring for Environmental Security) as will the increase in the overall budget to €70.2bn.

   Examples of successful networks in astronomy and space include Astronet, which set out a roadmap for astronomical research; the European Astroparticle Physics Network (ASPERA), the Optical Coordination network for astronomy (OPTICON), the RadioNet network of major radio observatories and the Europlanet research infrastructure project linking more than 100 planetary science institutions across Europe. In astrochemistry, the Laboratory Astrochemistry Surface Science in Europe (LASSIE) training network was formed as part of FP7 in 2010. LASSIE brings together 13 European universities, of which 5 are in the UK and is co-ordinated from Heriot-Watt University.

   The European Research Council (ERC) has come into being more recently (2007) as part of Framework Programme 7 and awards many grants for 'blue skies' research. UK-based scientists have been very successful in winning ERC funding, with the UK the biggest recipient of grants in the recent past. Senior scientists in the space and astronomy communities also cite the virtue of the ERC as a major source of income for large research projects. Typically ERC grants have a value of more than 1 million Euros, a sum that would be difficult to obtain within the present UK research council framework.

   In 4 of the last 5 rounds (to 2012), the UK led the EU in the number of ERC starting grants in the physical sciences. The UK received the highest number of advanced grants in the same area in the 5 rounds to 2012. Starting grants and advanced grants in astronomy in 2012-13 totalled €13.17m and €22.86m respectively.

2. Where has EU action had a **negative impact** for the UK in these fields? What evidence is there for this? Has EU action prevented potentially useful national action in any areas?

Lack of continuity from one Framework Programme to the next has from time to time meant a useful initiative has not been followed through.

3. How and where has UK engagement with partner countries or international bodies, both within and outside the EU, been helped or hindered by EU involvement?

   The various EU programmes are generally very helpful in fostering engagement by UK scientists with their peers elsewhere in the Union. Examples of these are set out in the answer to question 1.

4. What benefits or difficulties has the objective of a European research area (ERA) delivered for the UK?

   Researchers in astronomy and space science largely see this as neutral, though there is a larger flow of scientists between different EU countries than there was at its inception. The very open UK academic system benefits from this flow as many scientists ultimately find permanent employment in UK institutions, making for a vibrant and diverse academic cohort.

   The unfettered movement of skilled research labour envisaged in the original plans has however not really been delivered. An example of a remaining barrier is the difficulty in transferring employee pension rights between EU member states, something fundamental for researchers considering movement between countries rather than remaining in one nation for the duration of their career.

5. How has the EU sought to coordinate the policy instruments at its disposal across different policy areas to create an enabling environment for researchers and innovators? How successful has this been?

<u>Future opportunities and challenges</u>

6. What could the EU most helpfully do to promote scientific and technological progress and innovation (including in the space sector)?
   - How could the EU use its existing competence differently to deliver more in your area?
   - How might a greater or lesser degree of EU competence deliver more in your area?
   - How could improvements to existing EU activities make them more effective and efficient?

   An area where the EU could act is in the harmonisation of Open Access in scientific publishing. The UK government has a clear preference for 'Gold' Open Access for research funded through Research Councils UK. In contrast the EU does not specify a preferred route, meaning that researchers elsewhere in the world will in future be immediately able to access the work of UK researchers at no cost, whereas UK scientists will not necessarily be able to access the work of their peers overseas on the same basis. Establishing a preferred (gold Open Access) route across the EU would thus remove this competitive disadvantage between the member states.

7. Where might future EU level action be detrimental to your work in this area?

   Within the EU context, the European space programme often means only the navigation and environmental security programmes and potentially a new space situational awareness programme. Were the EU to take over the management of the space and Earth science programmes of the European Space Agency, they would have to make massive changes of approach to effectively manage such big programmes and to manage the technical implementation.

   The two programmes in question are the long term Cosmic Vision programme in space astronomy and solar and planetary science and the Earth Observation Envelope Programme (Living Planet) for Earth science. These programmes are directly linked to oversight at national level on both science priorities and technical implementation. ESA has not only an oversight, consultative and advisory structure but also a large staff of engineers and scientists to oversee industrial implementation.

   Moreover the ESA funding scheme specifically allows the development of long-term budgets on the 10-20 year time scale consistent with building large space observatories, planetary probes or new Earth observing spacecraft to open up innovative Earth science. At the moment, there do not seem viable structures available to the Commission to handle anything like this.

   Similar comments could be made concerning ESO, the European Southern Observatory, which although smaller in scale undertakes large projects in a manner to some degree reflecting the ESA approach. The EU has played a part in bringing ground-based astronomers together for long term planning (as in Astronet, referenced above). It has not provided the funds for more than study level work, nor should it, as long as cooperative infrastructure and the technical capability for building new facilities is grouped within ESO or through cooperation between nationally based observatories/funding councils, as in radio astronomy.

8. Where might action at national rather than EU level be more appropriate / effective?

   National oversight of very large programme development is at the moment better handled through the control that national agencies can exert within international organisations such as ESO or ESA. Similarly, the ability of national agencies to set up multilateral agreements with countries unconnected with the EU allows UK scientists to develop world class facilities without there being a sufficient base elsewhere in Europe. An example of this is the collaboration to build the Square Kilometer Array (SKA).

9. How could EU and national policies and funding streams interact better?

   Ideally there would be a recognised division of responsibility to escape any sense of “double-dipping” simply because either the EU or the national agency does not know what awards the other has made or is about to make. The direct role that UK funding agencies like the

research councils take in ESA or ESO has led to such a publicly understood division of responsibility.

10. What impact would any future enlargement of the EU have on this area of competence?

11. Are there any other points you wish to make which are not captured above?

    One area of concern is the disparity between EU-funded fellowships and studentships and UK-funded posts. EU funding often has very low overhead rates, leading some institutions to be reluctant to accept these awards (the same issue arises with charitable funding). There is also a lack of flexibility in EU grants to accommodate maternity and paternity leave by extending the grant timescale (but not the cost) to allow researchers to work the number of months they intended to. This is at odds with the stated goal of increasing the proportion of women working in science.

    Another weakness in European science is the lack of grassroots engagement in policymaking. In the UK the learned societies including the RAS make every effort to advise the Research Councils, civil servants, peers, ministers and elected politicians to help them shape policy for science.

    At EU level engagement is very much led by representatives from national governments and at least in astronomy and space science there are no effective Europe-wide representative bodies. There is thus a need for the EU and scientific community to work together to create structures to allow direct engagement between active scientists and European policymakers. At the moment this occurs through ad hoc or short term (linked to framework programme time scales) networking arrangements which certainly serve a useful purpose. However there is a need for a longer term but less specialist forums for such engagement.