

Response of the Solar System Advisory Panel to the STFC Balance of Programme (Skills) review

Community Consultation

25 May 2017

Background

The purpose of the Balance of Programme (Skills) exercise is to periodically review the balance of activity and funding across STFC's skills programme. It has the overall objective of identifying a desirable skills programme balance over the next 5 year period.

For the purpose of the review, STFC's skills programme is defined as formal, funded training and engagement schemes in the following skills areas; public engagement, apprenticeships, graduate trainees, studentships, fellowships. The review will only consider skills activities directly funded by STFC.

The Balance of Programme (Skills) review will be used by STFC to inform planning decisions, to optimise their impact in any financial scenario (positive, negative or neutral) and to position STFC to exploit future funding opportunities.

STFC would value community input to the review through its Advisory Panels. Panels are invited to respond to the following questions.

Consultation Questions

1) What would be the impact on research programmes of reduced/increased funding for skills activities relevant to them?

The panel believes that current levels of funding are such that further cuts would leave the community struggling to deliver quality research. Any cuts to current skills funding (for example, a 5% cut) will lead to a decrease in efficiency, a slow-down of research advances, and will lead swiftly to a negative impact on UK research output and international competitiveness. Furthermore, the skills gained through studentships and fellowships are essential to maintain a knowledge-based workforce for the UK's most important industries. This is key to the UK economy and international influence, which is already suffering huge uncertainty as a result of Brexit. Further spending cuts would substantially increase the risk of loss of UK competitiveness on the international stage, as well as being devastating for universities who are already feeling the effects of Brexit and the tightening of UK immigration policy. Many respondents in the 2016 STFC Solar System Advisory Panel community consultation felt that funding was already at, if not below a critical sustainable level. In the event of a 5% overall cut, the panel concluded that highest priority should be given to protecting the grants line of funding.

A 5% cut would leave several research groups without their lifeblood of PhD students - effectively spelling an end to their research programs in the mid- to long-term, and impoverishing the breadth of UK astronomy research. It will also have an indirect impact on undergraduate teaching. Groups that are unable to conduct research due to funding cuts will struggle to inspire undergraduates. It is also important to recognise that a -5% change cannot be considered in isolation from the effects of Brexit, which are already having a negative effect on the community. Particular factors of concern are the fall in the value of the pound, difficulties in attracting and retaining international staff, uncertainty regarding future participation in European research networks, and uncertainties in likely new rules regarding the movement of goods. Technical support, and technical apprenticeships within research groups, are vital and yet may be the most vulnerable to funding cuts. UK research depends critically on the wealth of technical skills within our laboratories and workshops, and these must be protected. Any loss of skilled technicians during a period of cuts would be very expensive to reverse.

A funding increase of +5% would enable a range of activities, including improvements to studentships and the fellowship programmes. This would enable us to attract and keep the most talented researchers. We would welcome maintaining current studentship numbers, and to focus the new investment on fellowships. Currently, availability of fellowships have become so competitive that certain parts of the community (particularly experimental and/or analytical laboratory based Solar System science) are not well represented. As well as increasing their numbers (and supporting the full cost of associated laboratory work), the profile of fellowships should be raised, providing a pipeline to academic positions. The cost of additional fellowships may be partly offset by providing the option of bursaries for 2 year MSc and MRes opportunities rather than full PhD studentships. This would achieve the goal of training highly skilled people into industry (in a shorter time), whilst the best students can continue to a full PhD.

In the case of an optimal funding increase, we would welcome steps to bring UK PhD studentships in line with other leading countries, where studentships are funded for 4 or even 5 years. This would secure the international competitiveness of our PostGrad community and increase the skills level of PhD students. We believe that the additional year of funding would greatly increase the publication rate of PhD students (and their supervisors), securing a direct return on the additional investment. This optimal scenario should not be considered at the expense of studentship numbers. An optimal funding increase will also allow exciting developments in MRes programs, leading to a direct increase in the number of students emerging with transferrable skills.

2) What is the most appropriate balance between skills areas and activities at different stages of the skills pipeline (public engagement, apprenticeships, graduate trainees, studentships, fellowships), in order to ensure a sustainable skills programme?

A big concern is an unsustainable lack of Postdoctoral opportunities that cannot be addressed with efficiency savings alone. Substantial increase in the number of fellowships, particularly junior fellowships, will secure continuation of UK research activities. In the medium- and long-term this is a more efficient model since it enables a substantial return on the training/skills resources invested at the PhD stage. As stated in last year's SSAP consultation, rebalancing the fellowship programme with small reductions in the number of advanced fellowships and a limit fEC on these fellowships would help offset the cost of re-establishing the junior postdoctoral fellowship scheme.

The number of STFC PhD studentships cannot be reduced from current levels without risking the research output of smaller groups. The current allocation scheme works, although an increase in the quota for the smaller groups would be welcome. The current system includes a significant component of transferrable skills training that is largely run by the host institutions and monitored by STFC. In the case of a flat or decreased funding settlement, then Doctoral Training Centers (DTC) are considered not be a viable alternative to the current system, as they would concentrate studentships into a smaller number of institutions, and possibly narrow the breadth of UK research. If studentship funding were increased, however, we would welcome consideration of a distributed DTC system as centres of excellence in developing skills for specific fields, particularly in technical, analytical capabilities or computing aspects of our research. One model to consider is that of the Gas Turbine Aerodynamics run between Oxford, Cambridge and Loughborough where a 1-year MRes is carried out mostly in Cambridge followed by a 3-year PhD at one of the three partner universities. There is scope to develop jointly-funded DTCs with other funding agencies. For example, UK Space Agency for space technology/engineering, or with bodies such as EPSRC or Innovate UK for computing. Linked to this is to consider an increase in the number of M.Res studentships. MRes studentships would provide an efficient provision of skilled personnel for industry, as well as a path for motivated students to continue for a full PhD.

We suggest that STFC assess the cost-effectiveness of broadening the STFC Undergraduate Summer Research Internships. These offer good value for money, and an unique opportunity for skills acquisition for the student. Consideration should also be given to 3-6 month internships during the academic year, that would enable both domestic and foreign students to conduct Masters-level research projects in the UK.

3) What are the opportunities for STFC in the skills domain to increase industrial impact and respond to the Industrial Strategy, GCRF and Newton Fund?

The training we provide to our Postgrads lead to individuals with highly-sought transferable skills, many of whom continue to successful with careers in industry. We, therefore, provide a valuable service to UK industry, and ultimately an indirect return on STFC's investment to

the UK economy. This is the most obvious way the Solar System community links directly to industry. An increased investment in the number of 2-year focused Masters programmes would be a good opportunity to build on this. For GCRF, the Masters programmes can be built on exchange schemes both for overseas students to train here, and for UK students to train in other countries. As well as providing an inspiring training environment, Masters programmes in solar system physics will give students a great breadth of transferable skills of direct benefit to their home countries. Technology/manufacturing development (e.g. detector technology) will also lead to direct economic benefit to developing countries.

The panel believes that STFC should review the CASE studentships. For example, they could be more closely linked to space missions, mission outcomes, with increased participation by non-industrial organisations (i.e., space agencies, national institutions). There is a strong argument that post-graduate apprenticeships within academic institutions, space agencies, or closely-related industries, would be a better use of funds than current CASE schemes.

STFC researchers have been slow to take up Newton and other overseas development funds, despite the fast-growing space sectors of many developing countries. We recommend that STFC considers funding a dedicated administrator to help researchers exploit these funds.

4) Our science programmes depend on a pipeline of skilled people.

General remarks from the community during the SSAP 2016 consultation suggest that the balance is approximately right between students, PDRAs, academics, and technical staff. However, the years of flat-cash funding have deeply affected the grants line and the numbers of PDRAs. There is a general consensus that the period between PhD and the ability to apply for an advanced fellowship (Royal Society URF or STFC ERF for example) is a major obstacle for junior scientists. There is some urgency for STFC to consider new schemes to replace European Research Council (ERC) Postdoc fellowships, and ERC Starting and Consolidator grants. These are important career-building steps for the best junior academics that may become inaccessible under Brexit. Technical support was one clear area where support was lacking and the balance was not positive. This is in both the skills for developing novel instrumentation and for the development of software and new models.

The field is now starting to see a lack of experience and leadership for the development of advanced numerical models; for example Space Weather Operations Centre, newly established at the Met Office, is facing a shortage of candidates with sufficient skills, experience and leadership in space weather forecasting/modelling.

In general terms, Solar System research produces students and postdocs who are highly computer literate with strong data analysis skills with relevance across a wide range of the public and private sector. Much of the UK theoretical work involves development and

running of high performance computer simulations. The skills gained from these tasks are essential in many industries, including finance and the world of 'Big Data'. Our Solar System science PhDs with strong computational skills have gone on to work for industry and public sector, including high-tech SMEs (e.g. First Light and Imaging, Fluid Gravity Engineering Ltd), National Rail, the NHS, and AWE. This is of clear benefit to the UK high-tech skills base.

The mission and instrumentation programme in the UK provides highly-skilled engineers. Satellite applications and the UK space sector benefit enormously from this training and the expertise present in UK academic institutions. The space sector is growing strongly and will contribute to an increasingly large part of the world economy in the coming years. The UK needs to invest in the area so that there is a sufficient amount of individuals at the forefront of space knowledge and technologies that can innovate in the UK.

It is essential that both scientists and engineers are schooled in best practice for software development, version control and curation, and that these skills are kept up to date. If there are no mechanisms to support the development of new internationally-competitive computer models then the UK will not remain internationally competitive. Any support mechanisms must recognise that the development of new models and code is akin to the development of scientific instruments: they often do not generate publications over a grant cycle. There are also issues over inadequate training for the use of national facilities and a lack of provision for software engineers in research groups (not system administrators, but professional software engineers).

5) Any other comments?

Many aspects of Solar system research is 'blue-sky' and may have no direct or immediate benefit to industry or society, especially compared to other STEM fields. Yet the decadal long-term impact of our research is invaluable. In the context of skills, therefore, it is important to recognise the value of blue sky research: the longer-term impact should be fully considered in fund allocation of apprenticeships, studentships and fellowships. Re-instatement of junior Postdoctoral fellowships is important to maintain this balance.

Widening the accessibility of studentships to foreign nationals would enable more efficient use of available funds by attracting the best talent to the UK, and would foster closer connections with the international community. A pilot scheme where a small number of studentships per year are open to international students should be considered. This is a timely concern since EU students may be subject to international fees following Brexit.