STFC Strategy

Institute of Physics input to a STFC consultation

A full list of the Institute’s submissions to consultations and inquiries can be viewed at www.iop.org

23 March 2009
Dear Professor Keith Mason

Chief Executive
Science and Technology Facilities Council
Polaris House
North Star Avenue
Swindon SN2 1SZ

23 March 2009

Professor Keith Mason
Chief Executive
Science and Technology Facilities Council
Polaris House
North Star Avenue
Swindon SN2 1SZ

IOP Institute of Physics

Dear Professor Mason

STFC Strategy Consultation

The Institute of Physics is a scientific charity devoted to increasing the practice, understanding and application of physics. It has a worldwide membership of over 36,000 and is a leading communicator of physics-related science to all audiences, from specialists through to government and the general public. Its publishing company, IOP Publishing, is a world leader in scientific publishing and the electronic dissemination of physics.

The Institute welcomed the opportunity to engage with the STFC in developing its Strategy. I hope that the workshop we organised on 9 March, which was the Institute’s main contribution to the process, was useful in providing constructive input from various members of the physics community. One general observation we had on the Strategy document is that in many places the difficulty of combining the two distinct roles of STFC is far too apparent, i.e. providing exploitation grants for long-term research endeavours for former PPARC areas, and the funding and maintenance of large facilities on behalf of RCUK. Frequently, statements made in one of the contexts look out of place for the other. For the STFC to develop a coherent long-term Strategy, this issue is one that needs to be addressed.

In addition, please find attached written input that we have received from the Institute's Astroparticle Physics, High Energy Particle Physics, and Nuclear Physics Groups.

Yours sincerely

Professor Peter Main
Director, Education and Science
We are pleased to note that it is the intention of STFC to ensure that its Strategy remains aligned with international priorities (p. 39), as exemplified by ASPERA, particularly as the profile of the field within the UK is smaller than that in mainland Europe where it is flourishing strongly.

The topics covered in the recent, widely-publicised, ASPERA review and Roadmap were:

- High Energy Gamma-Rays
- Neutrino Mass
- High Energy Cosmic Rays
- High Energy Cosmic Neutrinos
- Dark Matter Detection
- Gravitational Waves
- Low Energy Neutrinos and Proton Decay.

In addition, we note that STFC considers the discipline of Microwave Background Studies, where there is substantial investment, to be included in the subject of ‘Particle Astrophysics’.

We welcome the fact that STFC plans to continue to invest, via grant funding, in astroparticle physics. We are, however, currently frustrated that decisions over R&D grants (p. 54), expected in January 2009, have not yet been made. This is already causing difficulties with international partners who, understandably in view of recent events, are becoming more cautious of getting involved in collaborations with UK teams.

We welcome the fact that an Advisory Group (PAAP) is being set up though we regret that this has taken rather longer than was indicated in discussions last autumn. We wish to see this Group composed of scientists who are acknowledged experts in one or more of the topics listed above and preferably who are engaged already with one of the international collaborations already under way or being discussed.

We recognise, and believe that we can satisfy, the criteria given for selecting between different opportunities. We have some problem however with the phrase ‘the breadth and health of the research community served’ (p. 54). In new fields it is inevitable that researchers cannot point to communities of great numbers and urge that STFC recognises that much exciting work takes place at interfaces. This is particularly true for astroparticle physics where many of the instrumentation methods
are drawn from particle physics and are therefore unfamiliar to some of the more established communities. We believe that the quality of the science must similarly be viewed with the intention to take some risks: counts of expected paper numbers as an outcome cannot be given when a field is at an embryonic stage.

Within ASPERA, the phrase ‘astroparticle physics’ has been adopted rather than ‘particle astrophysics’, and, although it is a minor point, it would stress the intention of alignment with the ASPERA strategy if the same term was adopted within STFC. We note that the leading journal in the field is called *Astroparticle Physics*. 
STFC Strategy Consultation
Comments from the High Energy Particle Physics Group of the Institute of Physics

STFC needs to consider the target audience for this rather long Strategy document, and emphasise STFC’s uniqueness as the custodian of ‘Big Science’ capturing the excitement that surrounds the science areas it alone funds. In particle physics, the excitement of the LHC programme for all of physics was evinced by the 2008 media attention, and by the strong endorsement in the recent Wakeham Report (p. 42): “Within the heartland of the current discipline major opportunities exist in the area of particle physics with the initiation of the CERN Large Hadron Collider (LHC). The LHC promises to revolutionise our view of the Universe and its evolution as well as giving us a more profound understanding into the structure of matter.” The same report notes (p. 39) that the field as a whole leads the UK in terms of high citation impact journals and on attracting students to read physics, as well as, (p. 36) noting the significant economic impact of the subject. Nowhere do the many very positive messages around STFC science really come out strongly in the Strategy document. If policy-makers, the media or public are the target audience, this is a serious deficiency.

As a Strategy it lacks timescales, performance indicators, clear goals or quantitative targets. Nor does it make clear how STFC relates in a unique way within RCUK to the other research councils. Where goals are enumerated, as for example in section 1.5, they could equally well apply to EPSRC or NERC. There should be explicit mention of the key science themes, such as the central roles that particle physics and astronomy play in addressing fundamental scientific questions, and the increasing need in all science for big facilities to address major issues and the uniqueness of STFC in providing these.

We feel that the engagement with the public is given very little attention and roles already played by STFC researchers (usually without extra resource) in this are not mentioned. Education and outreach linked to programmes and projects are given much greater emphasis elsewhere, particularly in the US, and STFC has a key role through the excitement of its science and facilities in making a much bigger impact. The campuses seem to lack any kind of focus, such as visitor centres, and the UK facilities in general are woefully inadequate in terms of what they offer the public, despite the clear appetite in the UK, and in schools in particular, for STFC science.

The Technology Gateway Centres were proposed, as we understood it, to take advantage of the fruits of curiosity-driven research and to better ensure these are efficiently channelled to benefit UK industry. Not only is the role of the fundamental science in posing technically highly challenging problems missed, but the importance
to UK industry in winning contracts to deliver to international mega-projects is lacking. Benefits are found in terms of gaining new competencies with academic help and the prestige attached to demonstrating their capabilities on the world stage. High-tech companies benefit directly from engaging in these programmes, which provide an important support mechanism for their R&D. However, if one takes away the curiosity-driven research that drives the ingenuity of the research community, the many benefits from novel accelerator technologies, to sensor systems, to advanced magnets, to new computing paradigms will be lost. Nowhere does this message come across with the emphasis that is needed in the Strategy document, if it is to prevent short-term decisions costing the nation a loss of opportunity in the long term.

Finally, the crucial role of training in truly international environments and competing with the very best world-wide is never brought out. However, those who have pursued higher degrees in STFC subject areas will attest to the excellence of this education in preparing them to compete at the very highest levels in industry and commerce. In making its case to the government, STFC could benefit from better engagement with the universities who could help provide contacts, case histories and quantitative measures of training outcomes. It should be straightforward to demonstrate that STFC science areas have much to offer the top graduates in STEM subjects in terms of realising their full potential. Furthermore, with the strategy on science now being followed in the US, the UK needs to work hard to ensure the very best are not attracted away for good by the brighter prospects to do what they find exciting on the other side of the Atlantic.

In conclusion, we feel the Strategy document needs to be shorter, snappier and should aim to focus on a limited number of key messages, of which we would argue that those discussed above should be given much greater emphasis.
STFC Strategy Consultation

Comments from the Nuclear Physics Group of the Institute of Physics

The field of nuclear physics research is a small part of the overall STFC portfolio. Being as that may we feel that, perhaps as a result of being a new addition to the STFC funding remit, there is a real danger that the current Strategy document appears significantly to underplay the impact that research from nuclear physics could make in the future.

There are some fleeting references to issues specific to nuclear physics, but the document could be more strongly supportive of what is already world-class and world-leading research (the first priority bullet point in the document). Some of these issues will undoubtedly elicit comments from the research groups. We would like to highlight one general area that needs consideration in order to improve the document.

Under sections 2.3.2 Energy and Sustainability and 2.5.1.4 Energy Applications, we find it difficult to understand why STFC would not want to capitalise on the likely new build of nuclear power stations, as part of a wider drive towards a low-carbon economy. It could be argued that future nuclear power requirements depend on nuclear engineering rather than fundamental research, and thus STFC does not need to concern itself with nuclear power generation. This would be a squandered opportunity.

The young PhD-qualified people that are likely to be the new generation of scientists and managers within the nuclear industry are mostly attracted to the fundamental nature of research in nuclear physics. They subsequently find that at the end of their studies they possess an excellent match of skills for the nuclear industry. The UK academic nuclear physics community provides a demonstrable flow of PhD trained personnel to the nuclear power industry. In addition to this, there are several Masters-level courses providing specific training demanded by industry, which are delivered by STFC-supported academic staff.

New developments in, and expert knowledge of, radiation detection and monitoring will be a big factor in the decommissioning of old power stations (which will have to happen anyway). Added to this are the skills required in the use of nuclear applications in medicine: detector systems, isotope production, etc. The impending critical shortage of nuclear skills has been highlighted several times in recent years. By underpinning nuclear science, STFC could well make an enormous impact on improving the situation. This would be a clear economic and societal impact.
The Institute of Physics is a scientific charity devoted to increasing the practice, understanding and application of physics. It has a worldwide membership of over 36,000 and is a leading communicator of physics-related science to all audiences, from specialists through to government and the general public. Its publishing company, IOP Publishing, is a world leader in scientific publishing and the electronic dissemination of physics.