

Scottish Universities Physics Alliance: A Partnership for Excellence

Vision

Physics is a key discipline for any knowledge-based economy and its well-being is vital to a Smart Successful Scotland. It has consistently attracted many of our brightest young people because it offers much challenge and scope for creativity as well as the fascination of achieving a deep understanding of the world around us. Scottish physics needs world-class research to attract and retain the most inventive people. It needs world-class training to deliver that research and to meet Scotland's need for a numerate, creative and innovative workforce. It needs world-class knowledge transfer systems to help drive the technological innovation necessary to create and sustain a high-skill, high-income society in Scotland.

We believe that these needs can best be met by pooling and coordinating the substantial strengths of Scottish physics, enabling Scotland to deploy and develop all-round research excellence in physics. In combination, we can transform Scotland from a major centre for physics into an internationally-leading one, a magnet for funds and researchers and an engine for economic success.

Mission

We propose the formation of a Scottish Universities Physics Alliance (SUPA) that will place Scotland at the forefront of physics through co-ordinated promotion and pursuit of excellence. SUPA will encompass the largest body of top-class physics research in the UK, providing a strong basis for engagement with the wider scientific community through collaborations with major international centres.

SUPA will pool Scotland's strongest research areas, embracing and developing research excellence. Through a coherent approach to staffing strategy, research initiatives and funding opportunities, the Alliance will develop as a world leader in Physics, attractive to researchers and sponsors worldwide, and will enable SUPA to draw extra income into Scottish Physics from UK and international sources.

SUPA will establish a Scottish Graduate School of Physics that will develop and use distance-learning to make top-quality teaching in advanced physics available throughout Scotland, and will act as a magnet for the best young researchers from around the world.

Benefits to Scotland

Physics has always underpinned advances in engineering and is pervasive in 21st Century technologies from IT to medicine. The interdisciplinary nature of many of SUPA's activities will influence and promote innovation and advances in other fields. This, together with knowledge transfer into industry and society, will ensure that the benefits of SUPA are felt well beyond the subject boundary. Strength and coordination of physics in Scotland will be vital to the success of all three of the new Intermediary Technology Institutes. SUPA has the potential to rekindle the spirit of invention and creative thinking through which Scottish "natural philosophers" contributed so much to the Enlightenment and the Industrial Revolution.

- Additional international excellence in physics research, better coordinated and deployed to external and internal advantage.
- Enhanced research assessment returns through coordination, recruitment and training of outstanding researchers, and more effective use of resources and infrastructure.
- An efficient integrated structure for graduate training.
- Attracting more high-quality researchers to Scotland as staff, visitors and students.
- Enhanced success with UK and EU research sponsors.
- Enabling Scotland to respond to increased competition in research from the concentration of HEFCE investment in a few leading English institutions.

Issues

Scotland has many strengths within its existing physics institutions but these are sometimes below critical mass. Similar 'critical mass' problems in regions of England and Wales have led to some movements and mergers detrimental to the health and productivity of the best research groups. Our approach is to create a structure that preserves individual and institutional opportunity and freedom, but generates critical mass in key areas. This SUPA solution will be supportive, inclusive, collaborative and evolutionary. Our goal is to produce internationally-leading performance through coherence, coordination and cooperation.

Setting

Scotland is a major player in physics, with over 200 FTE academic staff situated mainly in five universities: Edinburgh, Glasgow, Heriot-Watt, St. Andrews and Strathclyde. Physics research also has a presence in most other Scottish universities, while physicists are often employed in Electrical Engineering and Mathematics departments. Six Scottish HEIs submitted to Physics in the 2001 RAE, numbers of staff and grades awarded being: Edinburgh (64.8, **5**); Glasgow (40.66, **5**); Heriot-Watt (31.25, **4**); Paisley (7, **3a**); St. Andrews (27.0, **5**); and Strathclyde (45.7, **4** – with a flagged group).

Scottish Physics departments have been successful in winning major research and training grants through schemes like JIF, SRIF, IRC, SRDG, Basic Technology, JREI, Engineering Doctorate, and Masters Training Packages. Many of these awards are multi-institutional and multi-disciplinary, so the basis for a coordinated approach is already embedded in the culture. HESA reports Scottish research income for physics in 2001/02 of over £23M, about 15% of the UK total and well ahead of the top English HEI (UCL at £13M). Scotland boasts 5 of the top 21 income-earners, and 75% growth over 3 years since 1998/99.

Structure and Initial Investment Plan

SUPA is defined by the participating HEIs, and by a set of research themes. It will be built around identified strengths under a multi-institutional agreement. The mission is to provide a framework for the long-term development of excellence in physics-based research in Scotland. SUPA is organised around research theme groupings that we have agreed are of international quality and weight, and that bridge across multiple HEIs. Five themes with a substantial cohort of internationally-excellent research have been identified at this stage, namely astro-space physics, condensed-matter and materials physics, nuclear and plasma physics, particle physics, and photonics. We have developed an initial plan for investing in a set of specific initiatives selected from these themes, with a mix of chairs, lectureships and fellowships, all directed at fostering multi-institutional projects. Our aim is an increase in research selectivity, which means that investment will roughly follow and so amplify top-quality research volume. However excellence will be invested in wherever it is found. Our prime aim is to see that excellent science is done, but we will also be specifically working towards co-ordinated submissions to the forthcoming RQA.

Management

SUPA will operate on the basis of a collaborative agreement negotiated between the institutions involved.

An Executive Committee will act on behalf of SUPA member institutions, and will sanction all resource deployments, resolve problems, and report formally to SHEFC and member institutions. It will comprise heads of physics departments, Chief Executive, Research Strategy Group spokesperson, and an Advisory Committee nominee. The Executive Committee will initially act on the basis of consensus, but once SUPA becomes fully established decision-making by suitably-weighted vote could become desirable.

The scientific strategy of SUPA will be developed by a Research Strategy Group (RSG) comprising the theme co-ordinators and the Chief Executive. This Group will assess the performance and prospects of each theme and of the whole Alliance, and make reports and recommendations to the Executive Committee. It will encourage engagement with other disciplines and research organisations (both within and beyond Scotland), and promote entrepreneurship and knowledge-transfer activities.

An Advisory Committee, with members from major international research laboratories, research councils and industry, and a SHEFC nominee, will oversee the operation of SUPA, meeting on an annual basis.

SHEFC Grant Proposal

Specific actions that will be proposed for investment in the initial phase are:

Appointment of a “Chief Executive” charged with organising and enabling the establishment of SUPA and its collaborative structures.

Creation of a Graduate School of Physics to provide training of the highest calibre.

Establishment of a distinguished visitor programme and international summer schools.

Appointment of high profile research leaders to build inter-institutional research activities.

New faculty positions for enhancing the research within the Alliance.

Investment in state-of-the-art research equipment and infrastructure and measures to promote its efficient collaborative use.

Appointments will be to individual HEIs, on a pattern and programme agreed by the Executive Committee. The pre-requisite for academic appointments within SUPA will be outstanding ability at an internationally-leading level in physics research.

A funding proposal will be submitted to SHEFC in early March, with a schedule of appointments and business plan. A 4-year grant of around £12M is envisaged, commencing 2004. Institutions will underwrite new appointments, and pick up support for them until RQA-based funding commences in 2009/10. Some institutional funding is likely to be available in support of the grant establishing SUPA.

Graduate School

The Graduate School, as a key integrating component of the Alliance, will develop and deliver advanced course material available to graduate-level students throughout Scotland. The key components are:

- Joint taught courses for graduate students by expansion of the Access Grid, development of distance learning modules, and short courses.
- International Summer Schools building on the 40-year track-record and proven international reputation of the “Scottish Universities Summer Schools in Physics” series.
- High-profile Scottish Graduate School prize studentships open to *all* nationalities.
- Pan-Scotland video relay of talks and colloquia.

Sustainability

The greatest longer-term cost is for the new academic posts. These positions are all associated with strategically important areas for the departments involved and the universities have agreed to underwrite them. Overall, the annualised cost is about 5% of current Scottish Physics research income (HESA plus SHEFC/R), so even a modest increase in these funding streams will achieve sustainability.

Summary

We believe that SUPA will nourish, strengthen and sustain the high quality of Scottish physics. The Alliance will brand Scotland as a place of world leading research. Increasing globalisation of science and technology makes collaboration vital to be able to compete with the best laboratories in the world. SUPA will provide the basis for attracting and retaining people of outstanding talent with the most creative ideas and so become an engine for sustained expansion of research quality and income. This proposal is directly in line with the SSAC recommendation on the creation of new integrated structures reshaping globally-competitive areas of science and encouraging high-risk, high-reward activities.

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