Scottish Universities Physics Alliance (SUPA)

International Advisory Committee (IAC) Meeting

University of Strathclyde Technology and Innovation Centre

Thursday 26 May 2016

Summary of Discussions and Recommendations

Membership and Agenda

The membership of the International Advisory Committee (IAC) with their affiliations is shown in Annex A. Those present at the meeting, including the IAC, the Board of Directors, the Executive Committee and the Theme Leaders are shown in Annex B, as well as those from whom apologies were received – a note by Eugene Arthurs was circulated to the IAC. The agenda of the meeting is shown in Annex C and the programme of the SUPA Gathering held on Wednesday 25 May 2016 is reproduced in Annex D.

The Gathering: Wednesday 25 May 2016

The SUPA Annual Meeting, renamed the Gathering, was very well subscribed with over 300 registrations - the splendid new Auditorium of the University of Strathclyde Technology and Innovation Centre was packed. The Committee welcomed the innovation of short introductions to the themes and interdisciplinary activities followed by a highlight lecture from each area. Pride of place of the new results was the Glasgow University's key role in the discovery of gravitational waves by the LIGO interferometers. The role of Ron Drever as one of the early proponents of the project was recognised.

In parallel with the science, there were splendid displays by Scottish companies and institutions of their research and commercial products, which were the fruits of physics-based research. There was a poster competition, the competitors being nominated by each of the themes and interdisciplinary activities, with members of the IAC being judges.

The afternoon was devoted to a description of the activities of the RSE Young Academy Physicists followed by an outstanding Keynote Address by Richard Ellis on the subject of 'Cosmic Dawn: Searching for the First Galaxies'. After refreshments, there was another outstanding lecture sponsored by the Institute of Physics by David Miller on the subject of 'Energy, the Internet and Quantum Mechanics'.

The IAC congratulates the organisers on a truly splendid day showing the strength and dynamism of Scottish Physics. **The Committee recommends that this excellent material be incorporated into the SUPA web-site which will benefit from refreshing.**

The Meeting of the IAC: Thursday 26 May 2016

The meeting opened with the sad news of the death of Wolfgang Sandner, who had only become a member of the IAC in 2015 and who was present at the 2015 meeting. His is a very great loss to the European Physics Community, particularly in his role as Director of the European-Level Research Infrastructure Facilities ERF-AISBL, specifically the 'Extreme Light Infrastructure' (ELI). From 2010 to 2012 he was president of the German Physical Society.

The IAC warmly welcomed Alan Miller's appointment as CEO of SUPA for the next four years. His presentation highlighted the remarkable achievements of SUPA in fulfilling the goals and aspirations of the Scottish Physics community and the expectations of the Scottish Government. We fully subscribe to the statement in his presentation that SUPA has resulted in:

> 'A powerful network of over 1200 research physicists, that creates a critical mass with links and relationships into national and international public bodies, private organisations and industry, that no one HEI can provide alone.'

Support for this statement was demonstrated in numerous ways:

- The high level of grant income
- The annual graduation of over 100 PhD students
- The considerable number of state-of the-art facilities funded by the SUPA II programme
- The continuing success of the graduate school in providing post-graduate education across the eight partner Universities with 50 courses providing 800 hours of lectures.
- The outstanding success of the partner Universities in increasing their positions in the 2014 REF. The performances of Strathclyde and the combined Edinburgh-St. Andrews joint submission were truly outstanding.

These successes are largely the result of the SUPA initiatives. Without the proactive support SUPA central and the role of the Executive Committee in cultivating the new collaborative culture, this would not have happened. We note that this is not just a question of academic distinction, but also results in a significant increase in the fraction of the funding which comes from the UK government to the Scottish Physics and Astronomy Departments.

The Graduate School has continued its excellent support of the Graduate Student programme, innovations including the new student welcome event. The plans to replace the Video Conferencing suites with a much more flexible and higher resolution system, which can potentially be used by industry as well as academe, is a welcome development.

The prize studentships continue to attract excellent students, despite the fact that there is no longer any SUPA central funding for these, the resources being provided by the partner Universities. The brand-name and proactive training programme are considerable attractions for high-quality students from the world-wide community. SUPA central continues to be used to assess the candidates and make recommendations about the awards.

A further important development is the formation of focus groups in the areas of Industry Engagement, Education and Outreach, and Research Foresighting of Physics. The IAC received reports from these three groups and there were brain-storming sessions in each of them before, during and after lunch. The outcomes of these deliberations are described below.

Other notable achievements include:

- The very strong performance in promoting physics throughout Scotland during the International Year of Light – per head of the population, Scotland far outstripped the other parts of the UK.
- Associate membership of the UK Astronomy Technology Centre, including the associated Higgs innovation Centre, with SUPA was formally agreed in May 2016. This paves the way for further alliances with the Fraunhofer APC, NPL-Scotland, SISSP and SU2P.
- The SUPA monthly newsletter, launched in January 2016.

The operation of the Graduate School as well as outreach activities were described by recent appointees Christian Killow and Anne Pawsey, while the Knowledge Exchange programme was discussed by Mat Wasley. Our considerations of these activities are included in our discussion of the outcomes of the focus groups.

There followed summary reports from the five Science theme leaders (Astronomy and Space Sciences, Condensed Matter and Materials Physics, Nuclear and Plasma Physics, Photonics, Particle Physics) and the two interdisciplinary groupings (Energy, Physics and the Life Sciences). Although brief, these presentations showed that the participants in each of the areas are continuing to carry out excellent and innovative research. We congratulate them on their undoubted successes.

These promise to be challenging times with the SUPA II funding terminating in 2017. The Executive Committee and the Board of Directors had recommended a reduced staffing of SUPA Central from 6.5 to 3.5 person-years of effort and this has been implemented. The Committee received the agreed Strategic Plan for SUPA for the next five years and this was described in some detail by the CEO. The plan is that the SUPA programme will be maintained at a reduced level of core funding of £150k per annum to be sought from the Scottish Funding Council.

It is worthwhile recording the Challenges and Opportunities as summarised by the CEO.

Challenges

- End of SUPA II funding in July 2017 (no cost extension during 2016/17)
- Maintaining adequate central support for SUPA post-August 2017
- Competing in an increasingly tough UK research funding environment
- New requirements on efficiency and productivity in research
- Creating and monitoring impact which often only comes good far down the line.

Opportunities

- Exploiting the very positive pan-Scotland relationships built up in SUPA
- Joining up the breadth of physics from the most fundamental science through translational and applied research to achieve recognised societal impact
- Retaining and utilising the high quality and intellectual capacity of our post-graduates and PDRAs in Scotland
- Working more effectively across boundaries to contribute to grand challenges
- Working in closer partnership with industry via industry-facing institutes
- Developing the existing knowledge base and structures within SUPA to extend advanced courses and training beyond Scotland.

Reflections and Recommendations

(1) Funding of SUPA Central

We are positively impressed by the CEO's approach to the challenges and opportunities listed in the above paragraph. The Committee was concerned, however, about the sustainability of the high quality and prestige of SUPA in the much contracted funding of SUPA central and the many tasks it has been asked to carry out on behalf of the community. We recognise that funding overall is tight, but the efforts to maintain and enhance the level of SUPA distinction will be jeopardised if there is not proactive support from SUPA central. We recommend that the CEO should assess the resources needed to provide more than the absolute core programme of activity, including the ability to support the various communal meetings, the meetings of the IAC and resources to support new initiatives from SUPA central. As a rough estimate, we believe a budget at least twice the proposed £150k per year would enable much enhanced central support to be provided, particularly in ensuring the continued and enhanced collaboration between the partner Universities.

There are various routes by which enhanced funding could be sought. An additional bid could be made to the SFC, recognising the remarkable success of the SUPA programme and its importance for physical science research in Scotland. Another possible route would be to invite the partner Universities to contribute to enhancing the SUPA central budget. There is no question but that the Universities have been major financial beneficiaries of the remarkable success of the Scottish Universities in the REF. **But all the additional resources go to the Universities and not to SUPA**. We would argue that the continued success of the Scottish Physics Departments depends upon the maintenance and enhancement of the collaborative and interdisciplinary activities which would not have come about without the existence and support of SUPA. These need to be fostered into the long-term future for the health of physics research in Scotland. If the resources are inadequate to maintain the current level of activity, we foresee a decline in the fortunes of Scottish physics. **We recommend that the CEO begins discussions with the Board of Directors about additional resources being made available to SUPA central to maintain the excellence of the present programme.**

(2) Reports of the Focus Groups

All participants in the open meeting split into three groups to discuss the contents of the three focus group papers which had been developed by SUPA central in collaboration with the SUPA executive. The results of these discussions, which were necessarily limited to about 45 minutes over lunch, convey some suggestions for consideration by the Executive Board.

(a) *Research Foresighting for Physics* (Chair: Mike Gunn)

The discussion was divided into two sections – general principles, and prime aims or concerns of each theme.

General principles The main questions discussed were: how to build impact cases and how to facilitate interdisciplinary work. To some extent these are related – engineering departments can help with developing impact cases and also with contacts with industry. The **Photonics theme** is a paradigm of spanning work from pure science through engineering to contacts with industry. An area where interdisciplinary work will be necessary to unlock resources is the ODA or Global Challenges funding, where healthcare and earth/environmental sciences are two obvious areas.

The Astronomy Technology Centre was praised for having contacts with other disciplines in terms of instrumentation, but whether or not this could be enhanced by discussions with different disciplines in their sensor and instrumentation needs was not clear.

Top priorities and concerns from themes

The representatives from each theme indicated their top priorities:

Photonics: Centre for Medical Photonics.

PALS: Mechanisms for generating future generations of leaders. There were worries especially about the numbers of PhD students. Gaps in CDT provision and the interface with BBSRC were also mentioned. The issue of where Bioengineering lay in pooling arrangements was raised in this discussion.

Condensed Matter: The non-equilibrium physics sub-theme is a priority area for the EPSRC and touches on many other themes, for example, in the Nuclear and Plasma Physics theme in the production of bright short pulses of XUV light.

Astrophysics: The highlighted areas for future development included exoplanets, planetary formation and gravitational wave astronomy.

Nuclear and Plasma physics: The development of advanced tools for fusion, nuclear astrophysics and particle physics, biomedical sciences and applications. The use of XUV radiation for non-equilibrium studies in condensed matter physics was mentioned as a possibility.

Energy: It was difficult to isolate a single priority, because of the diversity of the theme. Documentation on the theme of Materials for Energy is needed in readiness for calls for proposals. Interaction with the Energy Technology Partnership was regarded as crucial for future developments. The acquisition of a seat on the Board was a big step forward in this regard.

Particle Physics: While the Scottish effort is very coherent and accomplished, there may be vulnerabilities if the landscape changes quickly in the future.

(b) *Education and Outreach* (Chair: David Miller)

There are a lot of activities and ideas in educational outreach. Programs exist at the university level in Doctoral Training Centres and at the national level (STEMnet). The main points to come out of the discussions were:

- SUPA's best strategy is to help to coordinate the many education and outreach efforts so that everyone does not have to reinvent the wheel.
- Encouraging and supporting the post-graduate students to become involved in outreach activities. The students need to be pre-vetted so that they are well prepared for effective outreach activities. The graduate students are generally very effective in outreach to young people, but they need training and encouragement.
- The sharing of best practices and ideas across the SUPA universities as well as shared training of the students.
- The monitoring of the outcomes of the outreach programmes, for example, in keeping a documented record of the statistics of different types of education and outreach activities.

- Consider the possibility of appointing a coordinator to help with all aspects of the outreach and education activity.
- The dissemination of ideas and contacts through the SUPA newsletter.

SUPA should consider lobbying for uniform high standards of outreach across Scotland, rather than leaving the local authorities to generate their own procedures and practices.

It was also recommended that there would be benefits in enhancing collaboration in outreach activities with the Institute of Physics in Scotland and the Physics Vision programme.

(c) *Industry* (Chair: Derryck Reid)

Industrial impact of Scottish University Physics has to be a priority for SUPA. SUPA can act as a translational layer between university physics and industry. Training of graduate students for industry is a key function of SUPA and can be facilitated through the SUPA classrooms with the enhanced Video Conference facilities. Companies could use these facilities to provide appropriate training courses for students interested in careers in industry.

It would be valuable if SMEs could have access to the Centres for Doctoral Training programmes.

There was an emphasis upon the needs of industry for apprentices and apprenticeships. There is a need for advanced level training in the techniques used in advanced physics research in the Universities and how to tap into these by industry. The engagement with industry in this area is at various levels of maturity. This is an area where SUPA could take an important lead in facilitating the training of key personnel for Industry.

There is also a key need for helping with the transition of post-docs from Universities to Industry. There is a continuing need for Industry to be aware of what is going on in the Universities and likewise the Physics Departments understanding better the needs of Industry. SUPA may wish to investigate the most effective ways of translating innovation into industry.

The discussion highlighted an important change in philosophy of the Knowledge Exchange programme within SUPA. The original concept of support for relevant physics research coming from industry and SMEs did not prove to be a success. The welcome change of direction is that the emphasis has shifted to Knowledge Exchange and upon the provision of highly trained individuals for Scottish Industry. The resources need to be made available to expand the remit of SUPA in this area with the full involvement of the Physics Departments and their colleagues in industry.

(3) Diversity

Last year, the IAC expressed its serious concern about the lack of representation of women among the theme leaders and presenters at the Annual Meeting. This was regarded as unacceptable and sent the wrong message to the many excellent women at all levels in the SUPA community and to young women. This issue has been partly addressed by the new CEO, but there is still a considerable way to go to reach an equitable level of women representation in the SUPA programme and at the Gathering. We urge the CEO and the Executive committee to be proactive in addressing this issue.

(4) Other Matters

Post-doctoral Career Development There is a general concern, not just confined to the SUPA community, that more attention needs to be paid to the career development of post-docs. They need to receive timely advice about career progression in a highly competitive market. Only a fraction of them will remain in the academic sector. Appropriate mentoring programmes need to be implemented for them

A number of schemes were mentioned from which SUPA could potentially benefit. These include capitalising on initiatives such as Catapults, City Deals, Placements and Centres for Doctoral Training.

The future of pooling arrangements and their successes or otherwise are long term issues for Scottish Science. SUPA has been a very significant beneficiary of these arrangements, probably one of the most successful of all the Pools. The CEO will undoubtedly be closely monitoring future developments.

Malcolm Longair (Chair), on behalf of the SUPA International Advisory Committee.

29 June 2016.

Annex A

SUPA INTERNATIONAL ADVISORY COMMITTEE

MEMBERSHIP

- Prof Malcolm Longair (University of Cambridge) Chair of SUPA IAC
- Dr Eugene Arthurs (SPIE)
- Dr Allan Colquhoun (Selex ES)
- Dr Stuart Fancey (SFC)
- Dr Ana Gallardo (Scottish Enterprise)
- Prof Helen Gleeson (University of Leeds)
- Prof Ruth Gregory (Durham University)
- Prof Mike Gunn (University of Birmingham)
- Dr John Hand (EPSRC)
- Prof Walter Henning (Argonne National Laboratory)
- Prof Rolf-Dieter Heuer (CERN)
- Prof David Miller (Stanford University)
- Prof Ian Ritchie (Coppertop)
- Prof Anneila Sargent (Caltech)
- Dr Colin Zimmerman (NNL)

SUPA IAC MEETING ATTENDANCE 26 MAY 2016

SUPA INTERNATIONAL ADVISORY COMMITTEE

- Prof Malcolm Longair (University of Cambridge) Chair of SUPA IAC
- Dr Allan Colquhoun (Selex ES)
- Prof Helen Gleeson (University of Leeds)
- Prof Ruth Gregory (Durham University)
- Prof Mike Gunn (University of Birmingham)
- Dr John Hand (EPSRC)
- Prof Walter Henning (Argonne National Laboratory)
- Prof David Miller (Stanford University)
- Prof Ian Ritchie (Coppertop)
- Prof Anneila Sargent (Caltech)

APOLOGIES
Dr Eugene Arthurs (SPIE)
Dr Stuart Fancey (SFC)
Dr Ana Gallardo (Scottish Enterprise)
Prof Rolf-Dieter Heuer (CERN)
Dr Colin Zimmerman (NNL)

SUPA BOARD OF DIRECTORS

- Prof Celso Grebogi, University of Aberdeen
- Prof Tim Newman, University of Dundee
- Prof Ian Allison, University of West of Scotland

Prof Gerald Buller representing Prof Duncan Hand, Heriot-Watt University
Prof Andy Harvey representing Prof David Cumming, University of Glasgow
Prof Andrew Collier Cameron representing Prof Derek Woollins, University of St Andrews
Prof Rob Martin representing Prof Deepak Uttamchandani, University of Strathclyde, morning only
Apologies, no representative, Prof Richard Kenway, University of Edinburgh

SUPA EXECUTIVE COMMITTEE

- Prof David McGloin, University of Dundee
- Prof Martin Hendry, University of Glasgow
- Prof Derryck Reid, Heriot-Watt University
- Prof Graham Turnbull, University of St Andrews
- Prof Erling Riis, University of Strathclyde

Dr David Hutson representing Prof Des Gibson, University of West of Scotland
Apologies, no representative, Prof Antonio Politi, University of Aberdeen
Apologies, no representative, Prof Arthur Trew, University of Edinburgh

SUPA THEME LEADERS

- Astronomy & Space: Prof Ken Rice, University of Edinburgh
- Condensed Matter & Materials: Dr Brendon Lovett, University of St Andrews
- Energy: Prof Paul McKenna, University of Strathclyde
- Nuclear & Plasma: Prof Dino Jaroszynski, University of Strathclyde
- Particle Physics: Prof Paul Soler, University of Glasgow
- Photonics: Dr Robert Thomson, Heriot-Watt University
- Physics & Life Sciences: Prof Gail McConnell, University of Strathclyde

Apologies Dr Jennifer Hastie, Joint Photonics Theme Leader

Annex C

Scottish Universities Physics Alliance
INTERNATIONAL ADVISORY COMMITTEE MEETING

University of Strathclyde, Technology & Innovation Centre
99 George Street, Glasgow

Thursday 26 May 2016

09:00	**Registration**: Tea/Coffee
09:30	**Welcome**: Alan Miller, SUPA CEO
09:35	**Introduction:** Malcolm Longair, Chair, SUPA IAC
10:05	**Overview and Strategy:** Alan Miller, SUPA CEO
10:30	**Graduate School:** Christian Killow & Anne Pawsey
10:45	**Knowledge Exchange:** Mat Wasley
11:00	Tea, Coffee and Refreshments
11:15	**Astronomy and Space Sciences**: Ken Rice
11:25	**Condensed Matter and Materials Physics:** Brendon Lovett
11:35	**Nuclear and Plasma Physics**: Dino Jaroszynski
11:45	**Photonics**: Robert Thomson/Jennifer Hastie
11:55	**Particle Physics**: Paul Soler
12:05	**Energy:** Paul McKenna
12:15	**Physics and Life Sciences:** Gail McConnell
12:25	**Focus Groups: Break Out Session** Research Foresight; Industry; Education and Outreach
13:00	Lunch
13:30	**Focus Groups: Feedback and Discussion**
13:45	**Closed Session**
14:15	**IAC Feedback and Recommendations**
15:00	**Close of Meeting**

Annex D

SUPA

SUPA
2016 ANNUAL GATHERING

University of Strathclyde, Technology & Innovation Centre
99 George Street, Glasgow

Wednesday 25 May 2016

08:30 **Registration**:
Tea and Coffee, Foyer: Exhibition including SUPA student poster competition finalists

09:30 **Welcome and Opening Address**:
Prof Alan Miller, SUPA CEO;
Prof Sir Jim McDonald, University of Strathclyde

SUPA THEME HIGHLIGHTS: SUB DISCIPLINE THEMES

10:00 **Astronomy and Space Sciences:**
Introduction by Prof Ken Rice:
'The dawn of gravitational-wave astronomy', Prof Graham Woan

10:20 **Condensed Matter & Materials Physics**:
Introduction by Dr Brendon Lovett:
'Using superconductivity and magnetism to make magnetic gold',
Prof Steve Lee

10:40 **Nuclear and Plasma Physics**:
Introduction by Prof Dino Jaroszynski:
'Plasma and Nuclear Physics as Enabling Technologies',
Prof Dino Jaroszynski

11:00 Tea, Coffee and Refreshments, Foyer: Exhibition including SUPA student poster competition finalists

11:20 **Photonics**:
Introduction by Dr Robert Thomson:
'Exploiting multimode propagation for in-vivo endomicroscopy',
Dr Tomas Cizmar

11:40 **Particle Physics**:
Introduction by Prof Paul Soler:
'Pentaquark discovery at LHCb', Dr Greig Cowan;
'New physics searches at ATLAS at 13 TeV', Dr Chris Pollard

SUPA

SUPA
2016 ANNUAL GATHERING

SUPA THEME HIGHLIGHTS: INTERDISCIPLINARY/IMPACT THEMES

12:00 **Energy**:
Introduction by Prof Paul McKenna:
'Soft Materials for Energy Storage', Dr Job Thijssen;
'Solar-pumped Semiconductor Lasers', Dr Adrian Quarterman;
'Muon Tomography of Nuclear Waste', Prof David Ireland;
Discussion, Q&A

12:20 **Physics and Life Sciences:**
Introduction Prof Gail McConnell with Highlights from Prof Rory Duncan and Prof Tim Newman; Discussion, Q&A

12:40 Lunch, Foyer: Exhibition including SUPA student poster competition finalists

14:00 **EXPERIENCES OF RSE YOUNG ACADEMY PHYSICISTS:**
Introduction Dr Victoria Martin: RSE Young Academy;
Dr Tiffany Wood: RS Industry Fellowship;
Dr Joe Forth: Industrial Placement;
Prof Daniele Faccio: Imaging at the Speed of Light;
Dr Graeme Malcolm: Delivering Commercial Impact of Physics R&D – M Squared Lasers

15:15 Tea, Coffee and Refreshments, Foyer: Exhibition including SUPA student poster competition finalists

15:30 **KEYNOTE SPEAKER:**
Prof Richard Ellis, Professor of Astrophysics, University College London and Senior Scientist, European Southern Observatory, Carnegie Centenary Professor 2015
Cosmic Dawn: Searching for the First Galaxies

16:30 **Closing Address**
Announcement of the winner of the SUPA Poster Competition
Sponsored by Kaiam

16:30 **IoP Public Event: Refreshments**
Exhibition including SUPA student poster competition finalists

17:30 **KEYNOTE SPEAKER :**
Prof David Miller, Stanford Photonics Research Centre, Stanford University
Energy, the Internet, and Quantum Mechanics

18:30 **Close of Meeting**