Science Board
29 and 30 April 2015

Minutes of the Fiftieth Meeting
Polaris House, Swindon

Present:

Professor Alison Davenport (Chair) – University of Birmingham
Professor Dan Tovey (Deputy Chair) – University of Sheffield
Professor Marco Borghesi – Queen’s University Belfast
Professor Peter Clarke – University of Edinburgh
Professor Jon Goff – Royal Holloway, University of London
Professor Richard Harrison – STFC, RAL
Professor Alan Heavens – Imperial College London
Professor Jayne Lawrence – King’s College London
Professor Ken Long – Imperial College London and STFC, RAL
(except 14.4 – 14.7)
Professor Bob Nichol – University of Portsmouth
Professor Malcolm McMahon – University of Edinburgh
Professor Simon Redfern – University of Cambridge (Day One only)
Professor Alfons Weber – University of Oxford and STFC, RAL
Professor Chick Wilson – University of Bath

In attendance:

Professor Dave Newbold – University of Bristol and Deputy Chair
Projects Peer Review Panel (PPRP) (item 3)
Professor Paul O’Brien – University of Leicester and Chair, Astronomy Advisory Panel (items 10-11)

Apologies:

Professor Grahame Blair – Executive Director, Programmes
Professor Sean Freeman – University of Manchester
Professor Pam Thomas – University of Warwick

STFC:

Dr Sharmila Banerjee – Secretary, PPRP (item 3)
Sharon Bonfield – Programme Manager, Astronomy (items 10-11; 13)
Jenny Hiscock – Programme Manager, Particle Astrophysics and Nuclear Physics (items 3; 14)
Tony Medland - Head, Particle Physics and Nuclear Physics (item 14)
Trish Mullins – Secretary, Science Board
Dr Janet Seed – Associate Director, Programmes
Dr Colin Vincent – Head, Astronomy (item 13)
Dr Victoria Wright – Head, Research and Innovation Strategy (item 2)
[Secretary’s note: due to timing issues, some items were not taken in order; the minutes reflect the agenda item order.]

1.  **Agenda Item 1 - Welcome**

1.1. The Chair welcomed everyone to the meeting. Apologies were noted from Professor Blair, Professor Freeman and Professor Thomas. Professor Redfern would attend for Day One only.

2.  **Agenda Item 2 - Update on the Review of Free Electron Lasers (FELs)**

   SOME REFERENCES IN THIS SECTION HAVE BEEN REDACTED AS OFFICIAL SENSITIVE

2.1. The Chair welcomed Dr Wright, Head of Research and Innovation Strategy, to the meeting. Science Board received an update on the Free Electron Lasers (FELs) Strategic Review. The review panel had met twice. The first meeting had reviewed documentation, including the Science Requirements document, to determine the science requirement for FELs. The second meeting had considered current facilities, including those currently planned, to assess how these science challenges might be met.

2.2. The Physical Sciences and Engineering Advisory Panel (PS&EAP) and Life Sciences and Soft Materials Advisory Panel (LS&SMAP) were being consulted to ensure there were no omissions from the science challenges. Formal community consultation was not planned, although the Panel would seek input where necessary.

2.3. The review panel would meet again in May to consider the short and longer term needs in FEL capacity and capability, including any requirement for a UK-based FEL. It was confirmed that the strategy would include terahertz and infrared as well as X-ray facilities. The intention was for the draft report to be completed by late summer. This would be circulated to Science Board prior to consideration by STFC’s Executive Board (EB).

3.  **Agenda Item 3 - PPRP Report: UK Participation in the Pre-production Phase of the Cherenkov Telescope Array (CTA) (SB.15.50.01; SB.15.50.01a; SB.15.49.02a)**

   SOME REFERENCES IN THIS SECTION HAVE BEEN REDACTED AS OFFICIAL SENSITIVE

3.1. The Chair welcomed Professor Newbold, Deputy Chair, Projects Peer Review Panel (PPRP), Dr Banerjee, Secretary, PPRP and Ms Hiscock, Programme Manager, Particle Astrophysics.

3.2. Science Board noted that the Cherenkov Telescope Array (CTA) will be a major European facility for gamma-ray astronomy in the energy range from
~10 GeV to ~300 TeV. CTA aimed to bring an order of magnitude improvement in sensitivity in this energy range with expected scientific returns across a wide range of topics in astrophysics, astroparticle physics and cosmology. CTA would have observatories in the northern and southern hemispheres. UK deliverables would relate to the southern observatory.

3.3. Continuing UK involvement in gamma-ray astronomy, via CTA, was identified as a strategic priority for the UK within the 2013 STFC Programmatic Review as well as in key European roadmaps.

3.4. Science Board noted that, having considered the implications of cost reductions, the PPRP had recommended what it judged to be the appropriate levels of funding to ensure the best return to the UK within the funding available.

3.5. The proposal was assessed against a background of a highly constrained financial environment. On balance, Science Board recommended that CTA be funded at the level recommended by PPRP.

4. **Minutes and Actions (SB.15.49)**

SOME REFERENCES IN THIS SECTION HAVE BEEN REDACTED AS OFFICIAL SENSITIVE

4.1. The minutes of the meeting held on 26 and 27 February 2015 were approved, subject to minor amendments.

4.2. Actions from the meeting were reviewed. Actions that were incomplete were discussed and Science Board updated them, as appropriate.

4.3. It was noted that Professor Heavens may be unable to represent Science Board at the SPAC\(^1\) meeting on 17 June. Professor Harrison agreed to attend in his stead.

5. **Agenda Item 5 - Updates**

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5.1. The Chair updated Science Board on her attendance at STFC’s Executive Board (EB) on 17 March. Items discussed had included the STFC Light Touch Review which would be implemented on 1 June. Responsibility for Science Board would be with the STFC’s Strategy, Planning and Communications Directorate (SPC) which would also oversee the Skills and Engagement Advisory Board (SEAB) and Innovation Advisory Board (IAB).

\(^1\)UKSA Science Programme Advisory Committee
An invitation would be extended to Dr Cosgrove, Executive Director of SPC, to attend the July meeting of Science Board.

5.2. The Chair would be meeting the chairs of SEAB and IAB on 8 May to ensure that information was being exchanged efficiently between STFC’s senior advisory boards. STFC would explore whether the terms of reference for any of these boards should be amended to reflect the new structure and the requirement for engagement between them.

5.3. The Chair gave an overview of the review of the governance of Diamond. It was anticipated that the Diamond review report would be available for the July Science Board meeting. Science Board requested an update relating to the Diamond vision, once this was available.

6. **Agenda Item 6 - Director’s Report (SB.15.50.02)**

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6.1. Science Board received an update on the new guidelines on data policy principles.

6.2. The Large Facilities Steering Group had been stood down, with two new committees established that would not be chaired by the Research Councils. One of these, the Large Facilities Implementation Group (LFIG) had already met.

6.3. A sub-group of Science Board, the Large Facilities Sub-group (LFS) was scheduled to meet on 1 June to consider the scenarios prepared by the facility directors in response to the Science Requirements document. The LFS will report to Science Board in July.

6.4. Science Board received clarification of the potential UK costs for XFEL. The UK had observer status at XFEL Council.

6.5. Science Board noted the ongoing discussions relating to some form of accreditation process for departments, to ensure that those entered into the algorithm process meet minimum requirements concerning training provision.

6.6. Science Board noted the informal update from SEAB provided by Professor Freeman and, in particular, that he had raised the perception that there were reducing numbers of studentships associated with use of facilities. To further support this discussion, it would be important to provide evidence, for example, relating to facility use by PhD students. It was agreed that this would be raised at the meeting with the chairs of SEAB and IAB.
6.7. Some concerns had been raised by the Particle Physics Grants Panel (PPGP). STFC was aware of the issues and was actively seeking ways to manage this. Science Board would be kept informed.

7. **Agenda Item 7 - Update from the Accelerator Strategy Board (ASB) (SB.15.50.03)**

SOME REFERENCES IN THIS SECTION HAVE BEEN REDACTED AS OFFICIAL SENSITIVE

7.1. The Deputy Chair, in his role as the Science Board cross-member of the ASB, gave an update on ASB activity. Membership of ASB had been recently reformed to enhance representation from the accelerator community.

7.2. ASB had considered a number of Statements of Interest (SOIs) for accelerator development. The successful proposals would be considered by PPRP with the PPRP recommendations being considered by Science Board after endorsement and comment by ASB.

7.3. Following the development of the accelerator strategy, ASB planned to canvas the community to develop a strategic, prioritised list of projects that could be pursued in the event of opportunistic funding.

7.4. Science Board noted that there had been a workshop on accelerators for health and recommended that ASB work with other funders to explore the possibilities for accelerators in medicine that had been raised at this workshop, particularly to ensure 'clinical pull' in this area.

7.5. Science Board welcomed close working with ASB to ensure that all supported technologies underpinned STFC science. Some concern was expressed that the SOI process for accelerator proposals was not sufficiently well known. It was agreed that there should be wider advertisement of opportunities for accelerator development in future.

8. **Agenda Item 8 - Facilities Response to the Science Requirements Document (SB.15.50.04)**

SOME REFERENCES IN THIS SECTION HAVE BEEN REDACTED AS OFFICIAL SENSITIVE

8.1. Science Board received an overview of the Science Requirements process from Dr Seed. A Large Facilities Sub-group (LFS) of Science Board had been established. The process for evaluating the Science Requirements would be different from the previous exercise; two elements would be considered by LFS - a narrative element provided by the facility directors in response to the Science Requirements document and financial scenarios. LFS would consider each scenario against the identified science requirements and determine any impact on the facilities in each case. It was essential to have
Science Board and, through LFS, wider community input to the process. To allow such consultation, STFC agreed to explore whether the Science Requirements document was publicly available.

8.2. The LFS comprised members from Science Board (core and non-core) and from the PS&EAP and LS&SMAP. Science Board requested that STFC look to enhance the membership further with a ‘biology’ user of ILL and/or ISIS.

8.3. Science Board was encouraged to forward any further comments on the facilities response to the Science Requirements document. The report from the LFS would be considered at the July Science Board meeting.

8.4. Some concern was expressed that the facilities response document appeared to suggest that all aspects raised in the Science Requirements document were already adequately covered by the facilities. This was not the perception in some parts of the facility user community. Science Board felt that a clear statement should be given to facility directors that there may need to be improved communications with the community.

9. Agenda Item 9 - Interaction with the Astronomy Advisory Panel

9.1. Science Board discussed areas for discussion with the chair of the Astronomy Advisory Panel (AAP).

10. Agenda Item 10 - Exoplanet Science Review Report (SB.15.50.05)

10.1. The Chair welcomed Professor Paul O’Brien, the Chair of the Astronomy Advisory Panel and chair of the Exoplanet Science Review panel. It was noted that the exoplanet review report circulated to Science Board was in its final draft stage and would be refined further before recirculation to Science Board. The recommendations were unlikely to change.

10.2. The exoplanet review panel believed that exoplanets was a very exciting and vibrant area that had grown considerably in the UK; 10% of the astronomy community now worked in this area. An earlier review of the area in 2007 had concluded that the programme was not coherent and lacked ambition; however there was now a significant and well respected community that had obtained funding from external sources to build up access to facilities.

10.3. The exoplanet research community was relatively young with two thirds at lecturer level or below. The community was also attracting world-leading candidates from overseas. The field was very broad covering planetary atmospheres, techniques and facilities, although it was currently technically challenging to investigate planetary atmospheres.
10.4. The US community dominated publication numbers but the UK was now the best for publication numbers in Europe with the community also obtaining a significant fraction of STFC awards and being successful in obtaining European Research Council awards. A key change had been the increased emphasis in characterisation and on theoretical studies, for which DiRAC\(^2\) had become increasing important.

10.5. The review panel had undertaken a questionnaire to solicit community input and had solicited additional input by circulating the draft report to coincide with a community event.

10.6. The review noted that, while there were already a number of facilities which would find exoplanets, these did not have the capabilities required to characterise them. As a result, it would be important for the UK to support such facilities. Science Board discussed the recommendations in the report, which supported four main aims:

   10.6.1. Aim 1: Support of the transit roadmap;

   10.6.2. Aim 2: Develop a better understanding of planetary atmospheres through observations and theoretical research;

   10.6.3. Aim 3: Understanding the structure of disks and the formation and evolution of planetary origins;

   10.6.4. Aim 4: Determine the frequency, mass distribution and origins of orphan and cool planets.

10.7. There were a number of recommendations to support Aim 1, including the requirement for spectroscopy and radial velocity measurements that were vital to exploit the transiting planet discoveries. Currently, the community had access to such facilities in the southern hemisphere but not in the northern hemisphere. The review panel recommended that this should be rectified.

10.8. Recommendations to support Aim 2 included encouragement for ESO to ensure spectroscopic facilities were available, including E-ELT. There were fewer recommendations relating to Aims 3 and 4 but these included the need for microlensing surveys, such as Euclid and WFIRST, a NASA facility that the UK could join.

10.9. The panel had recognised that the UK could not provide funding for instruments in all areas but had found it difficult to prioritise one area over another. There was strong support for NGTS\(^3\) and PLATO and for facilities

\(^2\) Distributed Research utilising Advanced Computing
\(^3\) Next Generation Transit Survey
that allowed characterisation of planets. A high priority for the community was
for purpose-built spectrographs, for example, JWST\(^4\) to which the UK was
already committed. The stability of the spectrograph was of paramount
importance, particularly for radio velocity work.

10.10. The panel had expressed some concern about support for technology
development, the funding for which was perceived to fall between STFC and
the UK Space Agency (UKSA). It was important for the UK to have a role in
ESA missions funded by UKSA, including those currently being selected as
M4 candidates.

10.11. The Chair thanked Professor O’Brien and the review panel for the excellent
report and for the comprehensive summary presented to Science Board.

11. **Agenda Item 11 - Astronomy Advisory Panel**

11.1. Professor O’Brien gave an update on the recent activities of the Astronomy
Advisory Panel (AAP).

11.2. The highest priorities identified by the AAP were:

11.2.1. Grants, studentships and fellowships;

11.2.2. ESO, particularly access to VLT and ALMA, and providing a pathway
to E-ELT;

11.2.3. ELT and SKA R&D;

11.2.4. High performance computing, including support for the upgrade
cycle for DiRAC.

11.3. Other high priorities included completion of the SCUBA-2 survey by 2016;
completion of e-MERLIN surveys and support for LOFAR until SKA was
available; MOS instrumentation (WEAVE and MOONS); funding the UK role in
NGTS; UK access to LSST and access to 4-8m northern hemisphere
telescopes.

11.4. Since the last Programmatic Review, ESA had selected PLATO as an M3
candidate and ATHENA for the L2 theme. The M4 candidate mission
selection was underway, including two missions which were UK-led.

11.5. The AAP were content that Science Board had followed its Programmatic
Review recommendations as much as possible.

\(^4\) James Webb Space Telescope
11.6. The lack of funding available for postdoctoral fellowships was of concern to the community with a significant fraction believing their reinstatement was essential. The current situation was felt to be too reliant on EU funding. One option put forward by AAP could be to reduce funding for advanced fellowships to provide headroom for postdoctoral fellowships.

11.7. Priorities for capital investment were identified as ATHENA and CTA and space bilaterals, although it was recognised that the scope of ATHENA might have to be reduced to be within the available budget. LOFAR was felt to be undertaking excellent survey work, was good science value for money and provided strong training for young researchers in radio astronomy. Future opportunities included support for exoplanet research, time domain astronomy and radio astronomy.

11.8. It was noted that Science Board would potentially discuss instrumentation for NTT\(^5\) and INT\(^6\). Although the proposals were for very different science areas, Science Board would be considering these proposals on similar timescales to allow some tensioning of funding.

11.9. Science Board discussed the potential for overlap between different areas, for example, between the AAP and the Solar System Advisory Panel (SSAP) and between AAP and the Particle Astrophysics Advisory Panel (PAAP). There was a community perception that the boundaries between funding areas were opaque, particularly for interdisciplinary proposals considered by the astronomy grant sub-panels. Some concern was also expressed about the way in which the astronomy grant subpanels handled interdisciplinary areas such as exoplanets and particle astrophysics. STFC was asked to ensure clearer communication to the community on this. This should include reassurance that reviewers for each proposal were tailored and that grant panel chairs read all proposals across all panels to ensure consistency.

11.10. It was noted that there was no UKSA funding for science bilateral missions, even though they could provide excellent science value for money. It was felt that the UK may be missing opportunities for excellent science and exploitation of UK technology due to this. STFC was asked to ensure UKSA was aware of the community view. The AAP had discussed a number of examples where bilaterals exploited UK-developed technology. STFC encouraged the advisory panels to provide examples to UKSA.

11.11. Concern was also expressed by the AAP that the STFC/UKSA interface might not be functioning optimally. STFC agreed that these concerns should be included in the Science Board report to Council.

\(^5\) ESO New Technology Telescope
\(^6\) Isaac Newton Telescope
11.12. The Chair thanked Professor O'Brien and the AAP for the very informative update.

12. Agenda Item 12 - Research Interests

12.1. As relatively new members of Science Board, Professor Borghesi and Professor Lawrence introduced their science interests. Professor Lawrence’s presentation ‘Molecules, Membranes and Medicines’ included the use of neutrons scattering methods to investigate the interactions of drugs with cell membranes and drug formulation. Professor Borghesi’s presentation on laser-driven ion acceleration and applications included the development of methods to assess biological effects of ions for cancer therapy using STFC’s Central Laser Facility (CLF), particularly the Vulcan and Gemini lasers.

13. Agenda Item 13 - Statement of Interest: Terra Hunting Experiment at the Isaac Newton Telescope (THE@INT) (SB.15.50.06)

SOME REFERENCES IN THIS SECTION HAVE BEEN REDACTED AS OFFICIAL SENSITIVE

13.1. The Chair welcomed Dr Vincent, Head, Astronomy, and Mrs Bonfield, Programme Manager, Astronomy, to the meeting.

13.2. Science Board received an overview of the proposal from the introducer.

13.3. Science Board noted that THE@INT aimed to search for Earth-mass planets around solar-like stars at orbital distances akin to the rocky planets of our own solar system. It would be a dedicated radial velocity survey observing targets over a long period.

13.4. Science Board invited submission of a full proposal for consideration by the PPRP, and identified a number of issues to be addressed in this proposal.

14. Agenda Item 14 - Statement of Interest: Background Control for the SHiP Experiment (SB.15.50.07)

SOME REFERENCES IN THIS SECTION HAVE BEEN REDACTED AS OFFICIAL SENSITIVE

14.1. The introducer gave an overview of the project. Science Board noted that the SHiP experiment is a new general purpose fixed-target facility proposed for the CERN SPS (Super Proton Synchrotron) that will search for very weakly interacting particles in the GeV mass region and will complement the high-energy searches performed at the LHC. This could give significant insight on neutrino masses and dark matter.

14.2. Science Board could not recommend submission of a full proposal for consideration by the PPRP at this time.
15. **Agenda Item 15 - Statement of Interest: ATHENA (SB.15.50.08)**

SOME REFERENCES IN THIS SECTION HAVE BEEN REDACTED AS OFFICIAL SENSITIVE

15.1. ATHENA had been selected as an ESA large mission selected for ESA’s L2 launch slot in 2028. UKSA had requested advice from STFC through its Science Board on the scientific priority of the mission and its instruments. In order to provide this advice, Science Board requested clarifications of the ATHENA consortium (through UKSA) relating to the rationale for the data centre and the priority of the instruments.

15.2. Science Board restated that, if UKSA required discrimination between the instruments, it was content to carry out this process if it can be conducted on a timescale that is appropriate. In order to undertake this evaluation, the additional information requested from the consortium would be required.

16. **Agenda Item 16 - Update on the STFC Computing Strategy (SB.15.50.09)**

16.1. Dr Seed gave an update on the computing strategy and drew attention to paper SB.15.50.09 which detailed some of the main themes and messages that were emerging during the strategy development. The development of the strategy had taken longer than anticipated and it will cover the totality of computing support in STFC, including projects and campuses. A near-final draft of the strategy will be considered by Science Board at its July meeting.

16.2. Science Board noted that the messages and themes in the report were consistent across research communities. A number of issues were raised in discussion:

- **16.2.1.** There was a perception that funding for novel software development was removed during peer review. It was important to recognise that the requirement to move and optimise codes was essential to allow new technologies and/or increased code efficiency. It was noted that one of the themes emerging from the strategy was the requirement for a computing strategy for projects;

- **16.2.2.** The computing strategy should explore the novel opportunities provided by media such as the internet;

- **16.2.3.** Concern was expressed about the lack of career opportunities for software engineers; one of the reasons DiRAC had been successful had been the ability of those within DiRAC to offer support to less experienced researchers developing and optimising code;

- **16.2.4.** There was a new and increasing demand from facility users for access to high performance computing, particularly for biological
systems. At the moment, it was felt there was insufficient provision for this;

16.2.5. It was agreed that the cost of access to computing should be planned for, and included at, the beginning of a project and as an ongoing cost;

16.2.6. With the increasing emphasis on ‘big data’, a significant number of projects, particularly in astronomy, requested funding for data centres. STFC was encouraged to take a strategic view of this provision and to encourage research groups to recognise the additional science that can be enabled by having strategic centres and data storage.

16.3. STFC confirmed that the Science Board feedback on the draft computing strategy would be relayed to the review group.

17. Agenda Item 17 - Update on UKSA Interactions

17.1. A meeting had been held between STFC and UKSA to discuss interactions. STFC had requested that UKSA provide a plan for issues on which UKSA would be seeking advice during the coming year. This would include details of the information required and clear timescales. The plan would be available for the July Science Board meeting and would be updated regularly, potentially quarterly. To ensure clarity of information, it had been agreed that all communication and requests would be between the relevant STFC and UKSA groups and that there should be no requests directly from or between committees.

17.2. Science Board received an update on the consideration of M4 candidate missions and the UKSA Operations Review. It had been difficult to convene a sub-group to cover these broad processes but both exercises were underway.

18. Agenda Item 18 - Any Other Business
SOME REFERENCES IN THIS SECTION HAVE BEEN REDACTED AS OFFICIAL SENSITIVE

18.1. Science Board noted the information paper INFO SB.15.50.10 relating to the Science Board Large Facilities Subgroup.

19. Agenda Item 19 - Meeting Close

19.1. As this was the final meeting to be attended by Professor Weber as a member of Science Board, the Chair expressed the thanks and appreciation of Science Board and STFC for his invaluable contribution over a number of years.
19.2. Science Board noted that the next meeting will be 15 and 16 July 2015 in Swindon. The remaining meetings for 2015 were:

19.2.1. 22 - 23 October 2015

19.2.2. 15 - 16 December 2015

19.3. Venues were to be agreed but the meetings were provisionally to be held in Polaris House, Swindon.