

House of Commons
Science and Technology
Committee

**THE WORK OF THE
PARTICLE PHYSICS
AND ASTRONOMY
RESEARCH COUNCIL**

First Report of Session 2002–03

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*Report, together with
Proceedings of the Committee,
Minutes of Evidence and Appendices*

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SCIENCE AND TECHNOLOGY COMMITTEE

The Science and Technology Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Office of Science and Technology and its associated public bodies.

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FIRST REPORT

The Science and Technology Committee has agreed to the following Report:

THE WORK OF THE PARTICLE PHYSICS AND ASTRONOMY RESEARCH COUNCIL

Introduction

1. Our Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Office of Science and Technology (OST) and its associated public bodies.¹ Which “associated public bodies” are included is not clearly defined: the Non-Departmental Public Bodies associated with the OST are, strictly, sponsored by its parent Department, the Department of Trade and Industry (DTI) rather than by OST itself. But we have taken such bodies to mean the seven Research Councils and the Council for Science and Technology, and (in part) the Human Genetics Commission and the Agriculture and Environment Biotechnology Commission.²

2. In order to meet our responsibility for scrutinising the seven Research Councils, we have decided to hold a rolling programme of scrutiny sessions with each Research Council, with the objective of calling them all in over the course of the Parliament. Our first session was with the Particle Physics and Astronomy Research Council (PPARC) on Wednesday 26 June 2002.³ We received a written memorandum from PPARC in advance of the session and a second memorandum, answering some further questions, in October 2002. We have delayed finalising this Report until the announcement of the science budget allocations on 9 December. The transcript of the evidence is printed with this Report, together with the two memoranda from PPARC and three from other interested parties.⁴

3. The purpose of this Report is to draw attention to the evidence submitted and to highlight some of the key issues raised. As the first of our scrutiny exercises of the Research Councils, this has been an experimental process. We are grateful to PPARC for the positive way in which they responded. We appreciate that scrutiny imposes a burden of work on a Research Council, but it also provides an opportunity to advertise the role of the Council and the valuable research that it funds. The usefulness of these exercises depends, to a great extent, on the evidence given to us. When announcing future scrutiny inquiries we will encourage third parties to write in with any concerns or observations in advance of the oral evidence session.

¹ House of Commons Standing Order No. 152.

² The Human Genetics Commission is jointly sponsored by OST and the Department of Health. The Agriculture and Environment Biotechnology Commission is jointly sponsored by OST and the Department for Environment, Food and Rural Affairs.

³ The second session was with the Medical Research Council on 4 December 2002.

⁴ Ev 19-26

Origins and structure

4. PPARC was established on 1 April 1994, following the dissolution of the old Science and Engineering Research Council and as a result of the Government's 1993 White Paper *Realising Our Potential*.⁵ It is a Non-Departmental Public Body (NDPB) established under a Royal Charter and funded by grant-in-aid from OST's Science Budget. It is managed, on a day-to-day basis, by an Executive, headed by the Chief Executive, Professor Ian Halliday, and located in Swindon. It is governed by a Council, consisting of the Chairman (Mr Peter Warry), the Chief Executive and between 10 and 18 other members appointed from the academic and industrial communities by the Science Minister. The Council is advised by an Audit Committee, an Education and Training Committee, a Public Understanding of Science and Technology Panel, and a Science Committee, which is responsible for advising on long term strategies and priorities and major investment decisions. The Science Committee is itself advised by four science advisory panels and three further panels: the Technology and Industry Advisory Panel, the Space Science Advisory Committee and the Projects Peer Review Panel.

Objectives

5. PPARC describes itself as the UK's strategic science funding agency. The objectives it has established and set out in its Annual Report for 2001/02, are sixfold:

- to support the highest quality research in four fields: astronomy, Solar System science, astroparticle physics, and particle physics;
- to train top scientists and engineers;
- to further industrial competitiveness;
- to promote its science to the public;
- to improve its operational efficiency; and
- to develop e-science for all.⁶

PPARC's memorandum to us condenses these to four:

- world-leading research,
- trained manpower for research and the wider UK economy,
- innovation and technology transfer, and
- improved dialogue between science and society.⁷

6. PPARC's more detailed objectives and targets are set out in its annual Operating Plan, of which until now only extracts have been published. In oral evidence, we requested that this be published. Professor Halliday, PPARC's Chief Executive, pointed out that the Operating Plan sometimes contained information which was commercial in confidence, but undertook to consider publication.⁸ In its supplementary memorandum, PPARC stated

“We welcome the Committee's suggestion that we should put it [the Operating Plan] in the public domain. We have reviewed the objectives and targets which are set out in the plan. There are none in this Operating Plan which we would not wish to be made public, and we intend to place it on our website by the end of October. We would of course wish to retain the right not to put some of the targets in future Operating Plans in the public domain, but only where we believe that they are either

⁵ Cabinet Office, *Realising our Potential: A Strategy for Science, Engineering and Technology*, Cm 2250, May 1993.

⁶ *Annual Report 2001/2002*. Available via www.pparc.ac.uk; see Q1

⁷ Ev 1

⁸ Qq 1-7

commercial in confidence or might prejudice PPARC's negotiating position with, for example, international partners.⁹

PPARC has now placed some information from its Operating Plan 2002 on its website but there is still a great deal of useful information regarding its work and its targets which is not in the public domain. **We welcome PPARC's ready assent to our suggestion that it publish its Operating Plan 2002 and look forward to this undertaking being met. We also commend its commitment to publish targets in future, unless they are either commercial in confidence or prejudicial to negotiations. We recommend that other Research Councils follow suit.**

7. In addition to the annual Operating Plan, PPARC publishes a Strategic Plan every few years. The last was published in 2000.¹⁰ The next is expected to be published in the near future and will set out PPARC's strategy for the next decade.¹¹ Like all NDPBs, it also publishes an Annual Report to Parliament describing how it used its funds in the previous financial year. These are available on PPARC's website. Its annual Accounts are audited by the Comptroller and Auditor General and laid before the House. **The Accounts for 2000-01 were laid before the House on 11 July 2001 but not published until 2 November 2001. This delay is regrettable. PPARC's Annual Report and Accounts for 2001-02 were laid before Parliament on 23 July 2002 and published on the website immediately thereafter. We welcome this improved performance and trust that it will become the norm in future years.**

Funding

8. In the current financial year, PPARC is to receive grant-in-aid of £228 million from OST - 11.6 % of the total Science Budget. Table 1 below shows comparison with other Research Councils.

Table 1: Science expenditure - Main Estimates 2002-03 (£ million)

Research Council	2001-01 outturn	2001-02 working provision	2002-03 plans	2003-04 plans ⁽¹⁾
BBSRC	212.0	216.2	239.3	267.3
ESRC	71.8	76.9	84.3	93.6
EPSRC	413.6	479.3	498.4	463.6
MRC	319.7	358.7	373.6	414.8
NERC	178.9	189.4	203.4	256.2
PPARC	205.8	215.3	228.0	248.8
CLRC	4.1	10.5	11.0	91.3
Total OST Science Budget	1,529.9	1,832.4	1,923.6	2,246.4

Source: Central Government Supply Estimates 2002-03, HC 795, May 2002

⁽¹⁾ This column has been updated in line with the Science Budget 2003-04 to 2005-06, p8

⁹ Ev, para 22

¹⁰ Vision 2000: PPARC: opportunities and challenges for the next 10 years

¹¹ Q 1

In 2001-02 OST's contribution represented 92.7% of PPARC's income. It received some £16.7 million from other sources, including Joint Infrastructure Fund money, contributions by international partners and repayment work.

9. Table 2 below shows how PPARC spends its income. Figures are for 2001-02.

Table 2: PPARC Expenditure 2001-02

Expenditure	£000	Percentage of total spend
Staff costs	8,622	3.7
Research grants	64,497	27.6
Other grants and awards	42,295	18.1
International collaboration agreements	93,821	40.1
Other operating costs	13,795	5.9
Depreciation	4,809	2.1
Closure and reorganisation costs	2,541	1.1
Cost of capital	3,519	1.5
Total	233,899	

Source: PPARC Annual Report 2001-02

The distribution of expenditure is set out in Figures 1 and 2 on page 9.

10. PPARC did well out of Spending Review 2000, achieving Government agreement to membership of the European Southern Observatory (subject to PPARC restructuring its existing ground-based programme) and a high proportionate share of the investment in the new cross-Council e-science programme.¹² It was not successful in its bid for re-investment in the domestic space science programme. PPARC's bid to the Spending Review 2002 was targeted again on the domestic space science programme (gravitational waves and planetary exploration), on R&D in accelerator and detector technology for the Linear Collider (jointly with the Council for the Central Laboratories of the Research Councils), and on further investment in e-science (a cross-Council bid), as well as seeking a general uplift in baseline budget.¹³ PPARC's memorandum expressed concern about the Spending Review:

“Without substantially additional investment PPARC will be forced to retrench to a much narrower programme, which will mean that it will be at risk of gaining insufficient return from its investment, particularly in ESA, and will face a bleak future in particle physics post the Large Hadron Collider.”¹⁴

¹² Ev 2, para 16

¹³ Ev 3, para 17; Ev 23; Qq 47-48

¹⁴ Ev 5, para 37

Figure 1

PPARC overall programme, distribution of expenditure 2001-2002 (£M)

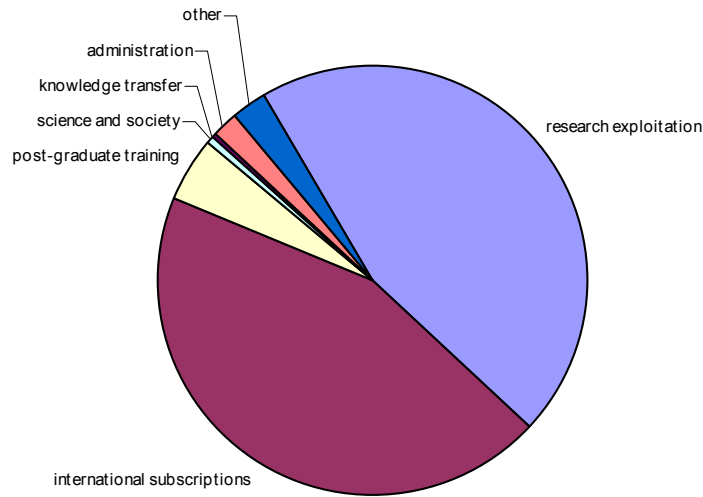
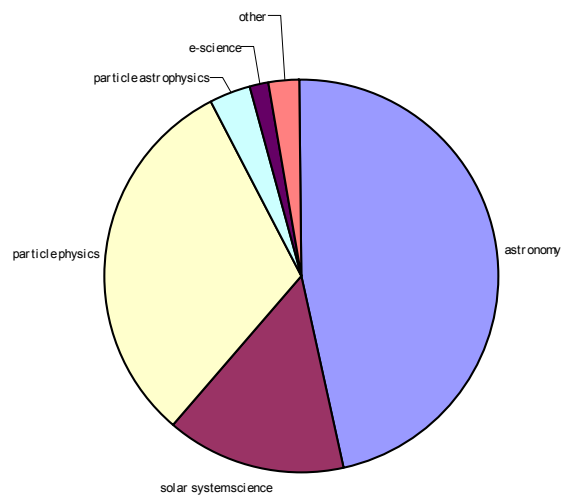


Figure 2

PPARC science programme, distribution of expenditure, 2001-2002 (£M)



PPARC Memorandum, ev p 6

Source:

Spending Review 2002

The science budget allocations for each Research Council announced on 9 December 2002 are set out below.

Table 3: The Science Budget 2003–04 to 2005–06

	Baseline	Additions to baseline			
<i>£ million</i>	2003–04	2003–04	2004–05	2005–06	% change from 03/04 to 05/06 ⁽²⁾
BBSRC	267.3	0.58	23.4	64.7	+ 34%
CLRC ⁽¹⁾	91.3	7.6	18.1	22.4	+ 43%
EPSRC: <i>of which</i>	463.6	4.6	27.8	82.5	+ 25%
Cross-Council core programmes	37.0	-	-1.5	6.2	
ESRC	93.6	0.4	9.9	25.7	+ 38%
MRC ⁽¹⁾	414.8	0.5	28.7	73.4	+ 24%
NERC ⁽¹⁾	256.2	0.5	16.6	41.5	+ 22%
PPARC	248.8	0.2	15.9	34.7	+ 20%

Source: *Science Budget, 2003-04 to 2005-06*

⁽¹⁾ These figures include the element of Councils' baselines set aside to provide public expenditure cover for EU receipts.

⁽²⁾ This figure combines resource and capital expenditure

11. PPARC received a general uplift to its baseline of £24.8 million. It will receive a further £31.6 million over the two financial years to continue its participation in the e-science programme, £5.4 million for joint participation with CLRC for accelerator science, and an additional £9 million for investment in gravity and planetary exploration. The science budget allocations identify three priority programmes for the 2003-04 to 2005-06 period: stem cells, sustainable energy, rural economy. The funding of another three cross-council programmes — e-science, post-genomics and proteomics and basic technology will also be continued. It is only in respect of the e-science programme that PPARC benefits from this separately identified priority funding. Its overall increase in percentage terms is therefore not as large as other Research Councils. Nearly half of PPARC's total expenditure is on international subscriptions, which it does not directly control.¹⁵ Another factor is the relatively small number of PhD students funded by PPARC, which dictates that the extra funding it will receive to meet the recommendations of the Roberts review to increase the PhD stipend (£2.9 million) is lower than that of other Research Councils.¹⁶ However, PPARC did receive additional funding in all the areas which it had identified as priorities as well as the uplift in its baseline which it had sought. **We particularly welcome the additional flexibility that the increase in the baseline figure will provide: a focus on certain priority areas should not be allowed to tie the hands of PPARC too tightly. The increase in investment in space science is also very timely. We will be interested to see the extent to which it enables the UK to increase the benefits it derives from membership of the European Space Agency and European Southern Observatory.**

¹⁵ See para 12

¹⁶ Science Budget, 2003-04 to 2005-06, p 43

International Subscriptions

12. Some 45% of PPARC's grant-in-aid, £102.3 million in the current year is spent on subscriptions to international science organisations. Table 4 below shows how this is divided.

Table 4: PPARC International subscriptions (£ million)

	2000-01	2001-02	2002-03
Anglo-Australian Telescope	1.3	1.3	1.3
European Incoherent Scatter Facility	0.5	0.5	0.5
European Organisation for Nuclear Research (CERN)	68.2	69.4	65.4
European Southern Observatory (ESO)			6.0
European Space Agency (ESA)	30.6	28.7	29.0
Total	100.6	99.9	102.3

Source: *Operating Plan 2002 and Annual Reports*

CERN

13. PPARC contributes some £65 million a year to CERN,¹⁷ the European Organisation for Nuclear Research, which has its headquarters in Geneva. This represents 17% of CERN's costs, a proportion determined by the UK's net national income. If the UK's income increases relative to its partners', as it has in recent years, the cost of membership increases. Professor Halliday thought that it was appropriate that the cost of membership was borne by the Science Budget, even though it put pressure on the domestic science budget. Paying such subscriptions out of the Foreign and Commonwealth Office budget, as was done in some other countries, would lead, he felt, "to an air of illusion about what some of this science is actually costing".¹⁸ Being the body responsible for payments brings the benefit that PPARC sits on the ruling council of CERN.

14. PPARC's memorandum expressed concerns about the financial situation at CERN.¹⁹ In September 2001 CERN management revealed that its projected expenditure over the next eight years was severely over-budget. CERN is currently building the Large Hadron Collider (LHC), the next generation of particle accelerator, due for completion in 2005. This was originally budgeted at 2.6 billion Swiss francs (about £1 billion). In September 2001 CERN management announced a projected overspend of 1 billion Swiss francs. According to Professor Halliday, the increase of the cost of LHC itself was only 400 million Swiss francs, but CERN management, for reasons that eluded him, had added a number of other unfunded requirements into the equation.²⁰ The UK and other partners took a stern line. An external review committee was set up. CERN has identified a route to savings of some 500 million Swiss francs from the projected overspend, still leaving a large overspend.

15. The UK was one of the 12 original signatories to the convention establishing CERN in 1954 and has played a leading role in its development ever since. In principle, the UK could walk out of CERN, after one year's notice, but, as Professor Halliday put it, the

¹⁷ Q 15

¹⁸ Q 14

¹⁹ Ev 5, para 36

²⁰ Q 22

“political downdraft” from withdrawal would be huge.²¹ Furthermore, the importance of CERN membership to UK science is considerable. Professor Halliday said “we could not do particle physics in a competitive way without being members of CERN”.²²

16. PPARC’s supplementary memorandum²³ is relatively upbeat. It reports a number of positive developments at CERN. The CERN Council has accepted the recommendations of the External Review Committee that the LHC be the highest priority, that the rest of the programme be substantially reduced, that there be changes in organisational structure to achieve clarity of responsibilities and better management controls, and that an Independent Audit Committee be created. It anticipates that by December 2002 the CERN Council will agree the implementation plan and a proposal for the establishment of the Independent Audit Committee.²⁴ **We note the improvements being made in the management of CERN. Yet we remain concerned that a body which receives £65 million a year of UK taxpayers’ money appears to have been so appallingly managed. We recommend that the Government and PPARC monitor closely the implementation of the External Review Committee’s implementation plan, if necessary, with the assistance of the National Audit Office, and report back to the Committee.**

European Space Agency

17. PPARC contributes around £30 million a year to the European Space Agency (ESA). ESA manages a range of programmes: basic research programmes which are mandatory for all Member States and optional programmes (Earth observation, telecommunications, space transport (Ariane) and manned spaceflight etc) to which Member States can opt in or out. The UK is a member of some of these programmes, though it contributes much less to these than France, Germany and Italy. Professor Wade, Director of Programmes at PPARC, regretted that, because of shortage of funds, the UK had not been able to participate in next year’s Integral mission, for example.²⁵ Nor is the UK a partner in the international space station. Professor Wade told us that, in comparison with its European partners, the UK was spending a far smaller percentage of its membership fee on exploitation.²⁶ Professor Halliday described as a “sore point” the fact that the UK had campaigned for ten years to make ESA deliver more missions for the pound, and that now they were doing that the UK was struggling to build the instruments to put on these missions.²⁷ We note that the Trade and Industry Committee’s Report on UK Space Policy, published in July 2000, highlighted concerns about the balance between ESA and national spending on space science.²⁸ The extra £9 million PPARC received in the 2002 budget allocations should help to redress this imbalance. We discuss the UK’s domestic space science programme further in paragraphs 30-31 below.

18. Professor Wade told us that “ESA actually operates a very strict regime of industrial return so that the UK gets back the exact share of its input into ESA as industrial contracts back to the UK, to the space industry and the software industry”.²⁹ He suggested that the UK’s space industry would argue that the investment in the science programme generates skills that are brought back into industry. The knowledge generated from British investments also feeds into a range of industries, including those concerned with

²¹ Q 24

²² Q 15; also Q 12

²³ Ev 22-26

²⁴ Ev 22

²⁵ Q 30

²⁶ Q 13

²⁷ Q 16

²⁸ Tenth Report of the Trade and Industry Committee, Session 1999-2000, *UK Space Policy*, HC 335, para 16; and the Government’s Reply thereto, HC 908

²⁹ Q 29

communications, earth observation and environmental monitoring. There is a concern that the UK, by failing to put sufficient resources into domestic programmes, is not getting value for money from its international subscriptions. Professor Halliday made the point in the case of CERN,³⁰ but the balance between subscription and domestic investment is crucial to all such projects. **In considering the level of future participation in ESA programmes, the benefits for the UK academic space science community are very important, but at least equal weight should be given to the wider benefits of these investments to industry.**

19. At present PPARC pays most of the mandatory contribution to the ESA Science Programme. Payments for the optional programmes and to the General Budget (covering indirect costs), are made via the British National Space Centre, which passes on some additional funding to ESA from the DTI. Following a review by the BNSC,³¹ some of DTI's responsibilities for funding will be transferred to two Research Councils from 2003-04. NERC (the Natural Environment Research Council) will receive an extra £41.3 million in 2003-04 and will be responsible for those ESA subscriptions which focus on earth observation science, such as the Earth Observation Envelope Programme and ENVISAT. PPARC will receive an extra £8.3 million in 2003-03 and will be given sole responsibility for payment of the ESA science programme subscription. This is a reallocation of existing money from the DTI innovation budget and is designed to improve the management of UK space policy. It is not part of the 2002 science budget allocations.³² **We trust that under the new arrangements the space research budget will be maintained at least at the present level and that the overall management of the budget will be noticeably better.**

European Southern Observatory

20. Under the Spending Review 2000, PPARC was given an additional £10 million a year to enable the UK to join the European Southern Observatory (ESO). The ESO manages the world's largest observatory in Paranal in Northern Chile, consisting of four 8 metre telescopes (somewhat unimaginatively named the Very Large Telescope).³³ Giving UK astronomers access to these telescopes is seen as essential. More important still is allowing them to participate in the global development of the next generation optical, infra-red and sub-millimetre telescopes.³⁴ Professor Halliday emphasised the importance of two projects in particular: the Radio Interferometer Array in the Atacama Desert in Chile, and the next generation optical telescopes, which will be 50 or even 100 metres in diameter and are known as the Overwhelmingly Large Telescope (OWL) project.³⁵ **We support a policy designed to maximize UK involvement in the next generation of telescopes, even if this means giving a lower priority to some existing facilities in which the UK enjoys considerable influence.**

21. The UK formally acceded to ESO on 1 July 2002, though access to the Very Large Telescope is not to begin till April 2003.³⁶ The annual costs of membership will be around £12 million.³⁷ This is to be partly offset by reduced access to other facilities, saving some £5 million a year.³⁸ Part of the cost of ESO membership is to be met by in-kind

³⁰ Q 15

³¹ This review followed a recommendation by the Trade and Industry Committee, Session 1999-2000, *UK Space Policy*, HC 335, para 81

³² Science Budget, p 57

³³ It also operates at La Silla, also in Northern Chile

³⁴ Ev 2 para 16

³⁵ Q 32

³⁶ See Operating Plan 2002, para 70

³⁷ Q 33

³⁸ Q 34

contribution.³⁹ In its supplementary memorandum PPARC said that the saving referred to will be effected by “restructuring the existing ground-based programme”.⁴⁰ It will be withdrawing the funding from its Jacobus Kapteyn and Isaac Newton Telescopes on La Palma by the middle of this decade. Depending on the results of negotiations on burden sharing, decommissioning of some other telescopes may be considered.⁴¹

Anglo Australian Telescope

22. PPARC contributes £1.3 million a year to the Anglo Australian Telescope at the Anglo Australian Observatory at Coonabarabran, New South Wales. This is a 3.9m optical telescope, commissioned in 1974. To date the project has been funded equally by the UK and Australia. The Operating Plan 2002 states that UK involvement will decrease after 2005-06.⁴²

European Incoherent Scatter Facility

23. PPARC contributes £0.5 million a year to the European Incoherent Scatter Facility, a high powered scientific radar system built as a joint project involving the UK, France, Germany, Norway, Sweden and Finland. It operates radar facilities at sites in Sweden and Finland, probing the upper atmosphere, ionosphere and the inner part of the magnetosphere.

Future collaborations

24. Plans are now being made for the successor to the CERN Large Hadron Collider, which will be an electron linear collider. PPARC has told us that a linear collider will cost around £3,270 million over the period 2003-12, of which the UK share might be around 10 per cent. The debate in the next year or so will be about where the machine should be built, and who will be the lead participants in its design and construction. Germany has published a design for a very high energy electron-positron linear collider (TESLA): this design lead stemmed from a decision several years ago at the German synchrotron centre in Hamburg (DESY) to invest in the R&D at a level of £20-30 million. Alternative designs are being developed by the US, Japan, and CERN. According to PPARC, to position itself the UK needs to increase its investment in relevant R&D to about £5 million per annum, and decide in the next year or so if it wants to participate and on its negotiating position on the siting of the machine.⁴³

25. Dr Kenneth Long of Imperial College wrote to us highlighting the possibility that the next world facility for neutrino physics, the Neutrino Factory, could be sited at the Rutherford Appleton Laboratory in Oxfordshire, with very positive effects both for the UK particle physics community and for UK industry. He argued that a modest investment in a targeted programme of Neutrino Factory R&D over the next few years would place the UK in a very strong position to host the facility.⁴⁴ Professor Halliday was positive about this, asking “Do we have the ambition to look 10, 15, 20 years into the future, invest, discourage competition by becoming better than other people?”. He acknowledged that this would be a gamble, in the same way that Germany had gambled to make Hamburg a

³⁹ See Operating Plan 2002, para 72

⁴⁰ Ev 23

⁴¹ *Ibid*

⁴² Para 9

⁴³ See Minutes of Evidence, Wednesday 19 December 2001, HC 459-i, Ev 19

⁴⁴ Ev 20

leading contender for the next generation linear collider.⁴⁵ The science budget allocations document refers to the extra £5.4 million for accelerator science being used to “win major shares in the construction, and possibly hosting, of major global facilities of strategic importance to the UK science base.”⁴⁶ One of PPARC’s objectives refers specifically to participation in a Linear Collider and Neutrino Factory but stops short of seeking to host such a facility. We are concerned that an opportunity may be being missed. **Hosting a global facility like the Neutrino Factory would bring substantial scientific and commercial benefits to the UK. While we acknowledge the uncertainty of international decisions many years ahead, we recommend that the Government or PPARC consider developing a long-term strategy for bringing this facility to the UK.**

26. Investing in particle physics and astronomy is clearly a long-term game. Professor Halliday acknowledged that reconciling long-term planning with Government’s short-term planning cycles was a problem and that it was necessary to make fairly positive assumptions, or else “you would end up not doing all sorts of important science”, while communicating the degree of risk to the science community.⁴⁷ Professor Wade pointed out that there was some sensitivity in their assumptions, for example about the run-down of existing projects.⁴⁸ It is important that PPARC has the necessary financial flexibility to enable it to plan the commitment of its resources beyond the three year planning cycle. We understand that OST approval is required if a Research Council wishes to carry forward more than 5% of its budget to the next financial year. **It would be unfortunate if PPARC was reluctant or unable to set money aside for major commitments in the future for fear of the Government reclaiming these unspent resources. We recommend that a mechanism be developed outwith the standard rules on carry forward of voted expenditure to allow Research Councils to put money aside for specified future uses.**

27. We note that PPARC’s Operating Plan 2002 has an interesting and candid table of assumptions and risks. We also note with approval the publication on PPARC’s website of a “Road Map” showing projected spend on different projects, and indicating decision points, over the ten years ahead. This document, updated annually, is an excellent aid to strategic thinking, serving as a valuable indicator to the science community of the timing of future important decisions and opportunities arising.

PPARC Overseas facilities

28. As well as subscribing to overseas facilities managed by international bodies, PPARC itself owns and manages a number of facilities overseas, incorporating optical, infra-red, sub-millimetre and radio telescopes. It owns three telescopes on La Palma in the Canary Islands: the Jacobus Kapteyn telescope, the Isaac Newton telescope, and the William Herschel telescope, which are operated in collaboration with Dutch and Spanish partners. It owns two telescopes on Hawaii: the UK Infra Red Telescope and the James Clark Maxwell telescope on the summit of Mauna Loa, which are operated by the Joint Astronomy Centre in Hilo on Hawaii in collaboration with Dutch and Canadian partners. It owns the UK Schmidt telescope at the Anglo Australian Observatory in Australia. PPARC’s supplementary memorandum states that the current total annual running cost of these UK telescopes overseas is about £8 million and that they have a capital value of some £32.2 million.⁴⁹ Professor Halliday emphasised that these facilities “are not all identical. They work at different wavelengths. They study different aspects of science. In some cases they have unique value and offered a “balanced portfolio of capabilities”.⁵⁰

⁴⁵ Qq 18-19

⁴⁶ Science Budget Allocations 2003-04 to 2005-06, p 43

⁴⁷ Qq 8-9

⁴⁸ Q 10

⁴⁹ Ev 23

⁵⁰ Q 41

29. Government agreement to membership of ESO was subject to PPARC achieving savings in its other ground-based astronomy programmes.⁵¹ The Operating Plan 2002 states that “the ground-based astronomy programme continues to be the subject of substantial review and it is planned by 30 November 2002 to have launched the first phase of the restructuring of PPARC’s overseas establishments. Such plans demand a significant reduction in numbers and costs.”⁵² PPARC’s second memorandum states that these savings “will be achieved by efficiency gains in the operation of the telescopes and by negotiating reduced partnership shares and/or other funding streams, for example EU funding for some of the existing telescopes. Depending on the outcome of these negotiations, decommissioning of some of the telescopes may be necessary, but there are no plans to decommission any in the short-term.” PPARC estimates that it would cost some £4.8 million to decommission its overseas telescopes.⁵³ **We note that the first phase restructuring has still not been announced. In conducting this restructuring we hope that PPARC will not shy away from making potentially unpopular decisions on decommissioning if that is the best way of concentrating resources on the most scientifically useful facilities.**

PPARC UK facilities

30. In the UK, PPARC funds the Astronomy Technology Centre, at the Royal Observatory in Edinburgh. In April 2001 the Government announced that it would be providing £4 million to PPARC for a new facility at the ATC in order to allow for the design and building of the next generation instruments for very large telescopes.⁵⁴ The new building is currently at the design stage. The £4 million is planned to be spent by end 2003-04. PPARC also funds the MERLIN (Multi-Element Radio-Linked Interferometer Network) / VLBI (Very Long Baseline Interferometry) National Facility which are based at Jodrell Bank.

UK Domestic Research Programmes

31. PPARC’s memorandum states that “The outcome of SR 2000 was highly favourable for PPARC and delivered through the opportunity of membership of ESO a step-function increase in investment in ground-based astronomy, and a substantially above inflation increase for particle physics albeit targeted on e-science, but it has necessitated significant restructuring of the short-term planned programmes.”⁵⁵ It acknowledges that the consequent reviews have given “rise to concern and some level of controversy about the impact on particular experiments and research groups, and the restructuring will lead to a loss of science.”⁵⁶ Professor Halliday referred to the closure of the Royal Greenwich Observatory as a cause of “a great deal of pain”.⁵⁷

32. Professor F W Taylor, Halley Professor of Physics at the University of Oxford, wrote to us suggesting that the operation of PPARC and its peer review system had encouraged “the operation of cartels among those who draw upon its resources, with the result that funding has been unduly biased towards certain fields to the exclusion of others”.⁵⁸ Specifically, he argued that ground-based astronomy and research on particles and fields

⁵¹ Ev 2, para 16

⁵² Para 125

⁵³ Ev 23

⁵⁴ Operating Plan 2002, para 122

⁵⁵ Ev 3, para 21

⁵⁶ Ev 3, para 25

⁵⁷ Q 42

⁵⁸ Ev 20

in space and in the near-space environment of the Earth had been disproportionately well supported, at the expense of planetary science. Mr Sadlier, PPARC's Director of Strategic Planning and Communications, rejected the suggestion of cartels, arguing that PPARC's peer review system, and its new advisory structure, were both robust and transparent.⁵⁹ Professor Halliday acknowledged that the UK had not been strong in planetary science, and said that this was why PPARC had bid for increased funds for this area in the Spending Review. **The £9 million dedicated to gravity and planetary exploration in the 2002 science budget allocations represents a welcome, if belated, opportunity for the UK to enhance its international reputation in these fields.**

Research manpower

33. One of PPARC's key objectives is to train the number and quality of scientists and engineers required to meet the needs both of the academic research community and its industrial and commercial user base. In the current year it is to spend some £11.7 million on postgraduate training and fellowships; this is planned to increase to £13.9 million in 2003-04.⁶⁰ By far the largest part is spent on three-year PhD studentships, of which 175 are to be awarded in the current year. It also provides around 40 fellowships a year to researchers at postdoctoral, advanced and more senior levels.

34. The Association of University Teachers raised three concerns with us.⁶¹

- PPARC - unlike the Economic and Social Research Council and the Medical Research Council - does not permit researchers employed on a Research Council to apply for research grants.
- A particularly high proportion of PPARC posts are on fixed term contracts, and a low proportion of "permanent" posts, in astronomy and geophysics.
- It argues that PPARC should take greater responsibility for the training and career development of PhD students and contract research staff.

These are important issues, which we have considered in detail in our recent Report on short-term research contracts in science and engineering.⁶² We found that the decision by some Research Councils not to allow researchers on fixed-term contracts to apply for research grants "is demeaning and stifles good ideas" and concluded that the Research Councils should harmonise best practice in this area.⁶³ Professor Halliday's comment that "it is very dangerous ... to let people who do not have a permanent contract apply for grants" is unconvincing.⁶⁴ We were pleased to see that the 2002 Spending Review announced training grants for Research Council-funded contract research staff and hope that PPARC will make good use of them. **Other Research Councils have adopted more constructive policies on contract researchers than PPARC. We fail to see any reason why PPARC should not follow the prevailing best practice.**

35. The AUT pointed out that, despite the lack of career jobs available, PPARC was planning to increase the number of its PhD studentships. PPARC's second memorandum confirms that it is increasing its studentships from 170 to 255 a year, and states that this increase has been stimulated by a number of factors, including the growth in the size of the

⁵⁹ Q 46

⁶⁰ Operating Plan 2002, paras 74-82

⁶¹ Ev 21-22

⁶² Eighth Report of the Science and Technology Committee, Session 2001-02, *Short-Term Research Contracts in Science and Engineering*, HC 1046

⁶³ *Ibid*, para 97

⁶⁴ Q 55

PPARC research community, the increased demand from universities for studentship support and the perceived demand from industry for more high calibre science graduates.⁶⁵ Professor Halliday argued that PPARC had a comparatively small number of long-term post-docs.⁶⁶ In its supplementary memorandum, PPARC indicates that it will be carefully considering the balance of its funding across its education and training programme and will consult with its user community. It also plans to undertake a further career path survey to understand the employment destinations of its former students.⁶⁷ **We welcome PPARC's efforts to plan its student and postdoc training policies but urge it to give closer attention to the career development of its present and future PhD students and post-doctoral fellows.**

Public communication

36. Promoting science to the public is one of PPARC's key objectives. In evidence as part of our inquiry into Government Funding of the Scientific Learned Societies on 12 June 2002, Professor Halliday told us that PPARC spent about £800,000 on "public understanding" activities and that this was "about to go up to a million".⁶⁸ PPARC's supplementary memorandum shows that the budget (£889,000 in 2001-02) was spent as follows:

Public engagement	£280,000
Inspiring the young	£185,000
Stimulating creative ideas for science communication	£180,000
Public accountability and dialogue	£160,000
Supporting the research community to communicate their work ⁶⁹	£80,000

37. In our Report on Government Funding of the Scientific and Learned Societies, we drew attention to the need for better co-ordination of public communication work.⁷⁰ The OST commissioned the British Association for the Advancement of Science to produce advice on the effective co-ordination and communication of science related activities. The report recommended the provision of an up to date database of "science in society" activities for the use of OST and, potentially, for the public. A number of other recommendations were aimed at improving understanding of public interest and participation in science.⁷¹ **If implemented, there is likely to be plenty of scope for PPARC, along with other Research Councils and organisations, to collaborate and co-ordinate their activities to obtain far better value for its spending on public communication. We hope that the Government will respond positively to the British Association's report.**

⁶⁵ Ev 23

⁶⁶ Q 54

⁶⁷ Ev 24

⁶⁸ Fifth Report of the Science and Technology Committee, Session 2001-02, *Government Funding of the Scientific Learned Societies*, HC 774-I, Q 241

⁶⁹ Ev 25

⁷⁰ HC (2001-02) 774-I, para 47 ff.

⁷¹ *Science in Society: Advice to the OST from the BA*, November 2002

Knowledge transfer

38. Knowledge transfer is another of PPARC's key objectives. PPARC's memorandum states, as an "issue of concern" that:

"advances in PPARC's science go hand in hand with the development of cutting edge technologies which then deliver substantial return in terms of knowledge transfer. PPARC continues to seek ways of working with industry to deliver innovation through a variety of schemes, and has recently invested in new Enterprise Fellowships and two new Faraday partnerships. There is, however, much more that can be done and PPARC would welcome a policy debate on how the new DTI Innovation Directorate, industry, universities and the Research Councils might forge more effective partnerships to deliver greater benefit for the UK economy."⁷²

PPARC's area of research has the image of being one of the least commercial in application. It accepts that the research it supports is not directly exploitable, unlike other areas of science such as biotechnology or IT, but it asserts that there is a long history of PPARC technologies underpinning advances in other sectors, notably medical instrumentation.⁷³ However, perhaps conscious of this image, PPARC has set out in detail its various knowledge transfer schemes in its supplementary memorandum. We note for example, a new programme to identify technologies at CERN of potential interest to UK industry.⁷⁴ Professor Halliday believed that there was a culture change happening, albeit at a slower rate than in the biological sciences, and thought there would be real progress in the next five years.⁷⁵ **We welcome the work that PPARC is doing to increase the commercial exploitation of research in its area of science, and we will be looking to see evidence of results. We recommend some form of regular analytical reporting to OST/DTI, and to Parliament, of the outcome of knowledge transfer schemes supported by Research Councils, rather than the current piecemeal reporting of arbitrarily selected highlights.**

Research infrastructure

39. The areas of science supported by PPARC are dependant on the availability of complex infrastructure and large equipment, both of which are costly and have suffered through the under-investment by the universities in science infrastructure. Professor Halliday told us that "PPARC has clearly been forced, over the past ten, 15 years, to provide a lot of infrastructure in universities that normally, historically, the universities would have provided."⁷⁶ He went on to emphasise the importance of investment in infrastructure and facilities in order to be competitive and to take advantage of opportunities offered by international initiatives such as the ESA. PPARC has provided infrastructure and major equipment for its academic community through the Joint Infrastructure Fund scheme and through the Joint Research Equipment Initiative. Projects supported include the new Visible and Infra-red Survey Telescopes for Astronomy and the refurbishment of the Lovell radio telescope at Jodrell Bank. It now has the opportunity to influence decisions regarding the distribution of funding under the Science Research Investment Fund, which is operated by the Higher Education Funding Councils. **We commend PPARC for its recognition of the infrastructure crisis in UK universities, which has affected some of its areas of research, and for its work through JIF and other funding schemes to remedy the deficits and to ensure that its academic community is in a better position to carry out world class research. We believe that**

⁷² Ev 5, para 38

⁷³ Ev 24

⁷⁴ *Ibid*

⁷⁵ Qq 58, 62

⁷⁶ Q 63

it is now important that the universities themselves put measures in place to ensure the rebuilding and maintenance of their infrastructure for the physical sciences through investment and by better management of their research funding. The implementation of the Transparency Review should encourage universities to establish and charge for the full costs of their research programmes. The dedicated funding stream for science research infrastructure of £500 million per year from 2004-05 announced in the Spending Review will also provide welcome assistance to redressing long-term underinvestment.

Conclusion

40. In this brief look at the work of PPARC we have in general been impressed at the way in which it manages its funds and goes about supporting UK science. A large proportion of its funding is passed directly to international organisations and is therefore difficult for us to monitor. We will be considering ways in which we can more effectively fulfil that part of our remit from the House to examine OST and Research Council expenditure. We have drawn attention to the problems in financial management at CERN: the failings there should provide useful lessons for similar projects in future. PPARC has done well out of the 2002 science budget allocations. The money allocated to specific areas is welcome, particularly in the case of space science, where the UK should be seeking to sustain its leading role in certain areas. Even more important is the general uplift in the budget baseline, which will provide greater flexibility for PPARC to take advantage of the first class facilities to which it has obtained access. **If the UK is to host a major international science facility, it will be necessary for the Government to show a greater willingness to co-operate with PPARC at an early stage to carry out the necessary development work to put together a serious bid, and then to commit the necessary resources over the long term to see it through. We believe that an ambitious and far sighted approach is needed to secure maximum benefit for UK science.**

LIST OF RECOMMENDATIONS AND CONCLUSIONS

1. **In order to meet our responsibility for scrutinising the seven Research Councils, we have decided to hold a rolling programme of scrutiny sessions with each Research Council, with the objective of calling them all in over the course of the Parliament (paragraph 2).**

Objectives

2. **We welcome PPARC's ready assent to our suggestion that it publish its Operating Plan 2002 and look forward to this undertaking being met. We also commend its commitment to publish targets in future, unless they are either commercial in confidence or prejudicial to negotiations. We recommend that other Research Councils follow suit (paragraph 6).**
3. **The Accounts for 2000-01 were laid before the House on 11 July 2001 but not published until 2 November 2001. This delay is regrettable. PPARC's Annual Report and Accounts for 2001-02 were laid before Parliament on 23 July 2002 and published on the website immediately thereafter. We welcome this improved performance and trust that it will become the norm in future years (paragraph 7).**

Spending Review

4. **We particularly welcome the additional flexibility that the increase in the baseline figure will provide: a focus on certain priority areas should not be allowed to tie the hands of PPARC too tightly. The increase in investment in space science is also very timely. We will be interested to see the extent to which it enables the UK to increase the benefits it derives from membership of the European Space Agency and European Southern Observatory (paragraph 11).**

CERN

5. **We note the improvements being made in the management of CERN. Yet we remain concerned that a body which receives £65 million a year of UK taxpayers' money appears to have been so appallingly managed. We recommend that the Government and PPARC monitor closely the implementation of the External Review Committee's implementation plan, if necessary, with the assistance of the National Audit Office, and report back to the Committee (paragraph 16).**

European Space Agency

6. **In considering the level of future participation in ESA programmes, the benefits for the UK academic space science community are very important, but at least equal weight should be given to the wider benefits of these investments to industry (paragraph 18).**
7. **We trust that under the new arrangements the space research budget will be maintained at least at the present level and that the overall management of the budget will be noticeably better (paragraph 19).**

European Southern Observatory

8. **We support a policy designed to maximize UK involvement in the next generation of telescopes, even if this means giving a lower priority to some existing facilities in which the UK enjoys considerable influence (paragraph 20).**

Future Collaborations

9. **Hosting a global facility like the Neutrino Factory would bring substantial scientific and commercial benefits to the UK. While we acknowledge the uncertainty of international decisions many years ahead, we recommend that the Government or PPARC consider developing a long-term strategy for bringing this facility to the UK (paragraph 25).**
10. **It would be unfortunate if PPARC was reluctant or unable to set money aside for major commitments in the future for fear of the Government reclaiming these unspent resources. We recommend that a mechanism be developed outwith the standard rules on carry forward of voted expenditure to allow Research Councils to put money aside for specified future uses (paragraph 26).**

PPARC Overseas facilities

11. **We note that the first phase restructuring has still not been announced. In conducting this restructuring we hope that PPARC will not shy away from making potentially unpopular decisions on decommissioning if that is the best way of concentrating resources on the most scientifically useful facilities (paragraph 29).**

UK Domestic Research Programmes

12. **The £9 million dedicated to gravity and planetary exploration in the 2002 science budget allocations represents a welcome, if belated, opportunity for the UK to enhance its international reputation in these fields (paragraph 32).**

Research manpower

13. **Other Research Councils have adopted more constructive policies on contract researchers than PPARC. We fail to see any reason why PPARC should not follow the prevailing best practice (paragraph 34).**
14. **We welcome PPARC's efforts to plan its student and postdoc training policies but urge it to give closer attention to the career development of its present and future PhD students and post-doctoral fellows (paragraph 35).**

Public communication

15. **If implemented, there is likely to be plenty of scope for PPARC, along with other Research Councils and organisations, to collaborate and co-ordinate their activities to obtain far better value for its spending on public communication. We hope that the Government will respond positively to the British Association's report (paragraph 37).**

Knowledge Transfer

16. **We welcome the work that PPARC is doing to increase the commercial exploitation of research in its area of science, and we will be looking to see evidence of results. We recommend some form of regular analytical reporting to OST/DTI, and to Parliament, of the outcome of knowledge transfer schemes supported by Research Councils, rather than the current piecemeal reporting of arbitrarily selected highlights (paragraph 38).**

Research infrastructure

17. **We commend PPARC for its recognition of the infrastructure crisis in UK universities, which has affected some of its areas of research, and for its work through JIF and other funding schemes to remedy the deficits and to ensure that its academic community is in a better position to carry out world class research. We believe that it is now important that the universities themselves put measures in place to ensure the rebuilding and maintenance of their infrastructure for the physical sciences through investment and by better management of their research funding. The implementation of the Transparency Review should encourage universities to establish and charge for the full costs of their research programmes. The dedicated funding stream for science research infrastructure of £500 million per year from 2004-05 announced in the Spending Review will also provide welcome assistance to redressing long-term underinvestment (paragraph 39).**

Conclusion

18. **If the UK is to host a major international science facility, it will be necessary for the Government to show a greater willingness to co-operate with PPARC at an early stage to carry out the necessary development work to put together a serious bid, and then to commit the necessary resources over the long term to see it through. We believe that an ambitious and far sighted approach is needed to secure maximum benefit for UK science (paragraph 40).**

LIST OF ABBREVIATIONS USED IN THE REPORT AND EVIDENCE

AUT	Association of University Teachers
BBSRC	Biotechnology and Biological Sciences Research Council
CERN	European Organisation for Nuclear Research
CLRC	Council for the Central Laboratory of the Research Councils
DTI	Department of Trade and Industry
EPSRC	Engineering & Physical Sciences Research Council
ESA	European Space Agency
ESO	European Southern Observatory
ESRC	Economic and Social Research Council
LHC	Large Hadron Collider
MRC	Medical Research Council
NDPB	Non-Departmental Public Body
NERC	Natural Environment Research Council
OST	Office of Science and Technology
OWL	Over Whelmingly Large Telescope
PPARC	Particle Physics and Astronomy Research Council

PROCEEDINGS OF THE COMMITTEE RELATING TO THE REPORT

WEDNESDAY 11 DECEMBER 2002

Members present:

Dr Ian Gibson, in the Chair

Mr Mark Hoban
Mr Tony McWalterDr Andrew Murrison
Bob Spink

The Committee deliberated.

Draft Report (The Particle Physics and Astronomy Research Council), proposed by the Chairman, brought up and read.

Ordered, That the draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 40 read and agreed to.

Resolved, That the Report be the First Report of the Committee to the House.

Ordered, That the Chairman do make the Report to the House.

Several papers were ordered to be appended to the Minutes of Evidence.

Ordered, That the Appendices to the Minutes of Evidence taken before the Committee be reported to the House.—(*The Chairman.*)

[Adjourned till Wednesday 18 December at Four o'clock.]

LIST OF WITNESSES*Wednesday 3 July***PARTICLE PHYSICS AND ASTRONOMY RESEARCH COUNCIL**

Professor Ian Halliday, Chief Executive, Mr Jim Sadler, Director, Strategic Planning and Communications and Professor Richard Wade, Director, Programmes Ev 7

LIST OF MEMORANDA INCLUDED IN THE MINUTES OF EVIDENCE

1. Particle Physics and Astronomy Research Council Ev 1

LIST OF APPENDICES TO THE MINUTES OF EVIDENCE

1. Dr K R Long, Imperial College Ev 19
2. Dr F W Taylor, University of Oxford Ev 20
3. Association of University Teachers Ev 21
4. Particle Physics and Astronomy Research Council (supplementary) Ev 22