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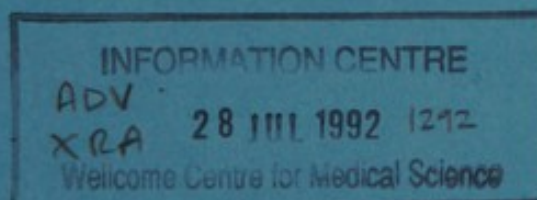
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SCIENCE AND PUBLIC EXPENDITURE 1987

a report to the
SECRETARY OF STATE
FOR EDUCATION & SCIENCE
from the
ADVISORY BOARD FOR
THE RESEARCH COUNCILS



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The Rt Hon Kenneth Baker MP
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Your reference

Our reference

19 June 1987

Dear Secretary of State,

PUBLIC EXPENDITURE SURVEY 1987: THE SCIENCE BUDGET

I am pleased to submit to you the Board's advice regarding this year's Public Expenditure Survey. It builds on the Strategy Advice which we presented to you last month and, in particular, proposes a range of initiatives to make a substantial start on the strategic reshaping of the science base which we regard as essential.

The total increases in the Science Budget which we recommend in this submission are considerable. They reflect the marked divergence between the real terms reduction implied by the Government's present expenditure plans and the increased investment in science which we, and other commentators, consider necessary in the national interest. Part of this difference is attributable to substantial increases in costs outside the Research Councils' control. Meeting those will be a prior condition for any reshaping of the science base; otherwise Councils will necessarily be engaged in damaging short term reductions in important current programmes and will lose what limited flexibility they have to redeploy funds and manage the introduction of new initiatives.

In one important respect this PES advice is incomplete. As you know, the costs of CERN are under review: Professor Abragam will be presenting an interim report to the CERN Council very shortly and member Governments will need to consider the recommendations over the next few months. For the purposes of this submission we have assumed that there will be a marked reduction in the UK's subscription in line with our previous advice. The Board will take an initial view next month on the likelihood of such a reduction being achieved and on the implications for the UK's continued membership of CERN. I shall write to you further with that advice and its expenditure consequences.

You may also need to supplement this advice in respect of decisions within Government about the British Antarctic Survey and the British

National Space Centre's plans, the possible expenditure consequences of which - on the advice of the Department's assessors - we have not addressed.

The Board and I would be pleased to discuss with you any points arising from this advice. We trust that, as on previous occasions, you will agree to its publication.

Yours sincerely,

David Phillips

DAVID PHILLIPS

1987 PUBLIC EXPENDITURE SURVEY:

ADVICE OF THE ADVISORY BOARD FOR THE RESEARCH COUNCILS

Introduction

1. This submission presents the Board's annual advice to the Secretary of State for Education and Science on the implications of the Government's expenditure plans for the Science Budget.

2. In the corresponding submission last year we advised that to meet national needs the Government should provide for increases in the Science Budget planning figures of £35 million in 1987-88, £50 million in 1988-89 and £60 million in 1989-90; plus any additional sums needed to compensate for the effects of exchange rate movements on international subscriptions. In November the Government announced increases in the Science Budget of £24 million for 1987-88 and £20 million for later years. These sums fell significantly short of what was needed even to maintain the buying power of the Science Budget at the level it had been when we formulated our advice. During the year the fall in the value of Sterling and pay settlements above the Government's inflation allowance had increased costs by £30 million in 1987-88 and £35 million in later years - well above the additional sums made available.

3. Our reaction to this outcome was one of dismay, and we informed the Government that we would be considering the implications of present policies in a strategy document which we were preparing as a basis for consultation. We presented this Strategy Advice to the Secretary of State on 6 May 1987. Our PES advice this year has been formulated with that strategy in mind and should be read in conjunction with it. We have focussed in particular on the steps we believe should be taken to restructure the science base and thereby to increase the strategic return to the UK.

THE HEALTH OF THE SCIENCE BASE

4. We remain convinced - for the reasons set out in our last PES advice, restated in our Strategy Advice, and underpinned by the research we have commissioned - that the Government should, in the national interest, increase its investment in the science base. In summary these reasons are:

- i. The science base exists to serve national needs: it is the essential seed-bed for future marketable technologies and trained scientific manpower.
 - ii. These needs have become more pressing in recent years, and the pressures are continuing to grow, in large part from industry. We welcome this; the nation's future economic success hinges on it.
 - iii. International competition has increased, both in scientific research and in commercial exploitation. We must invest in the science base at a level which will help UK industry to meet this challenge, and which will keep our best scientists in the UK.
 - iv. Society's more widely based aspirations, as articulated in Government's policies - for example for better health and a cleaner environment at reasonable cost - depend in the short or longer term on research undertaken by the science base.
 - v. The number of opportunities for scientific research is growing rapidly. Because public resources for research cannot reasonably be expected to grow at the same rate, we must plan for selectivity and concentration of support. This requires reorganisation and restructuring which in the short term requires increased investment.
 - vi. The relative costs of undertaking research are also increasing. This increase in costs has been well above the ability of the science base to absorb without affecting research capability.
5. Our conviction of the need for greater investment - and the Government's past endorsement of much of our reasoning - is however not consistent with current intentions for the Science Budget. The Government's present expenditure plans provide for it to decline by over 4% in 1988-89 and by a further 1.5% by 1990-91, after allowing for forecast levels of general inflation. Moreover, because the costs of scientific research are rising faster than costs in the economy as a whole - for the reasons described in our earlier advice and below - Councils are accordingly having to plan for even larger reductions in the real volume of science. This runs entirely counter to the increases we believe the nation needs.

6. In the Board's view UK science is now at a watershed. If the prospective decline in funding is averted but no more, the best we might hope for is:

- retaining world leadership in some fields of science, though with gradually reduced international standing overall - particularly in physical sciences - as other countries increase their investment in research;
- within the Science Budget, progressive redeployment of funds towards new scientific opportunities and into areas of strategic benefit to the UK - but at a rate substantially less than we believe the nation needs.

The alternative, which we recommended in our Strategy Advice, is to take positive steps to strengthen and develop the science base. The Government cannot of itself ensure that British scientists remain in the forefront of advancing knowledge, nor that the fruits of their research are fully exploited to the UK's benefit. But we have no doubt that the Government can help create the conditions in which those outcomes are more likely. Purposeful action is needed to ensure that research is better focussed, that the available resources are used to best effect and that science's contribution to the nation's economic development grows rapidly. Such action will require increased investment to bring about the necessary reshaping of the science base and to support more strategic research.

RESHAPING THE SCIENCE BASE

7. In our Strategy Advice we set out the scientific and financial case for greater selectivity and more active management of research, and expressed concern that on present policies we would not achieve quickly enough the degree of concentration of effort which is needed to maintain the international competitiveness of our university research. We wish to see a more purposeful redeployment of university research effort, with more active management, a more inter-disciplinary approach, and more effective links with industry. With these considerations in mind we recommended the development of inter-disciplinary university research centres and the pursuit of more directed programmes of strategic research.

University Research Centres

8. Our proposal for the establishment of university research centres (URCs) is intended to increase the capacity of the science base to concentrate effort in areas of strategic national and international importance; to organise continuing programmes

of research to meet specified objectives in such areas; to focus on the relevance of research to applications; and to mobilise scientists across a wide range of conventional academic disciplines. These aims reflect the best features of the Research Council institutes. They need to be given greater emphasis in universities whilst preserving the flexibility and capacity for innovation which flourishes there.

9. We are anxious to make an early start with this initiative: research centres of the quality we envisage cannot be created overnight and it will be several years before enough can be established to have the planned strategic impact on the shape of the science base. The funds needed will be a mixture of new money and redeployed money. Broadly speaking new money will be needed for equipment and capital facilities, including buildings in some cases, and for some staff costs. But it will be possible to redeploy money to cover the costs of research at the Centres which would otherwise have been met by project or programme grants spread across several universities; and an element of private funding could be injected through the development of effective links with industry.

10. Since finalising our Strategy Advice last month we have been working with the Councils and others to develop more detailed plans for URCs, addressing both the mechanics of establishing and running such centres and the identification of research fields in which developments of this sort might make a particularly useful contribution in the next few years. It is clear to us that there can be no one model for URCs: each will need to be created with specific attention to its "mission" and to related research already in train elsewhere. Some might be quite small with a fairly tightly focussed team of scientists, but others will necessarily be larger and require considerable expenditure on major equipment. Some will provide the means for developing newly emerging fields of science, such as in higher temperature superconductors; whilst others might be the vehicle for necessary refocussing and bolstering of research programmes, for example in toxicology. Some, for instance in surface science, may have particularly close links with industry. Within the broad umbrella, however, we believe that it will be essential and possible to ensure not only that high priority science is facilitated, but that research centres established under this initiative each promote the underlying aims of achieving greater concentration and more inter-disciplinary research.

11. It is still too early to put forward firm proposals for the first tranche of URCs which we consider should be established. As made clear in our Strategy Advice, we regard the priority as creation of research centres in fields which are the responsibility of the SERC, but centres in fields within the remit of the other Councils

will also make valuable contributions to our objectives. The following are illustrative examples:

Superconductivity The recent discovery of materials which are superconductive at higher temperatures than previously known has sparked a world-wide upsurge of research in this field. Potential applications with enormous economic benefits beckon - particularly in power transmission and electronics - but as yet there is little understanding of the underlying science. SERC is already funding some work in this field, but if the UK is to be at the research forefront so as to increase opportunities for exploitation by British industry, there will need to be a significant increase in the present volume of research and the currently disparate efforts will need to be better focussed. This would be achieved through a dedicated research centre providing for the necessarily inter-disciplinary work.

Surface Science The physical and chemical nature of surfaces plays a key role in many important industrial processes, but the underlying mechanisms are not well understood. Recent advances in analytic techniques offer the prospect of significant new work on surface properties. A research centre in this field would bring together chemists, physicists and process engineers to explore problems of strategic significance to many industries, including: development of materials for the control of corrosion, and adhesion; investigation of reactions occurring during welding and sintering; processes used in the manufacture of electronic devices (vapour deposition, ion implantation); and research into catalysis and thin film preparation. Significant industrial involvement would be likely.

Toxicology This is widely recognised as a subject of both scientific interest and practical importance, reflecting growing concern about the risks of toxic chemicals and suspected toxins in industry, agriculture and the environment. The MRC currently has a specialist unit at Carlsalton but this is relatively isolated and the subject remains under-developed in universities. The establishment of a university research centre, with major inputs from chemists and molecular biologists and links to pathology and clinical medical departments, would provide the basis for both refocussing and considerable expansion of research in this field, potentially with significant practical benefits.

Deep Crustal Studies Research to enhance our knowledge and understanding of the deeper crust of the UK would have potential pay-offs scientifically by advancing knowledge about the characteristics of sedimentary and crystalline structures; technologically through the enhancement of drilling and geophysical and geochemical logging capabilities; and with long term applications relating to oil, gas, coal and strategic mineral resources. The establishment of a research centre would provide a focus for work from several universities and NERC institutes and ensure that the maximum value was gleaned across all disciplines from the necessary costly drilling programme.

Other fields of research which we are considering as the focus for possible university research centres include: food science; engineering design; the synthesis of new materials; molecular sciences; process simulation and control; clinical immunology; land use; population biology; and oceanographic observation. Some of these may prove not to meet our basic criteria and, no doubt, other subjects of high priority will emerge as the concept of university research centres is further developed. Moreover, if URCs are to achieve the objective of stimulating organic change in the distribution of university research, we regard it as essential that the universities themselves should be involved in promoting and developing proposals for future centres.

12. If six URCs, meeting our criteria, were established in each of the next three years, substantial progress could be made - both in the particular fields selected and in securing our wider strategic objectives for reshaping the science base. Until these proposals have been worked up in greater detail we cannot be certain about costs, particularly as regards those parts of the costs (in several cases more than half) to be met by the redeployment of existing programmes. Our best estimate at present is that a programme of this scale would require additional resources totalling £10 million in 1988-89, £30 million in 1989-90 and £50 million in 1990-91.

Strategic Programmes of Research

13. University research centres will, however, only cover part of the terrain. They will need to be accompanied by action to improve the effectiveness of other parts of the university research effort. Our Strategy Advice highlighted the need for more directed programmes of research and correspondingly less reliance on response to individual project applications by university scientists. We see inherent value in the stability of funding and flexibility of working which programme grants

offer to research teams. And such a regime offers Research Councils more opportunity to manage their overall portfolios in the light of Britain's scientific needs.

14. We drew particular attention in our Strategy Advice to opportunities for developing programmes with strategic potential for applications - for example in plant biotechnology, neuroscience, information technology and electronic materials. We have examined carefully the scope for redeploying funds to support these and other promising opportunities in strategic science and engineering. However, following the rigorous scrutiny of recent years most existing commitments are of high priority, and it is clear that major initiatives will require new funds or the sacrifice of important activities.

15. We are particularly concerned about a number of strategic research opportunities which are being held back through lack of funds. In several cases the Research Councils have made initial investments in these areas but have reached the limit of what can be redeployed either quickly enough, or without withdrawing from other important areas. After allowing for some degree of further redeployment including what could be facilitated from our Flexibility Margin, we have identified high quality programmes of research with potential strategic importance which would require additional resources totalling £24 million in 1988-89, £31 million in 1989-90 and £39 million in 1990-91. Some of these programmes might be associated with future University Research Centres, most would involve close co-operation with industry (some perhaps through the LINK initiative), and all would facilitate the shift in the balance of Councils' portfolios towards more directed programmes which is an essential part of the necessary reshaping of the science base.

16. The largest element of these programmes would be for work to ensure that the UK can sustain important research in information technology. Major progress has been achieved through the Alvey Programme, now being succeeded by the more downstream IT86 Programme. To ensure the success of the latter and that there are opportunities for profitable developments in the 1990s, there needs to be a complementary programme of research which provides scientific underpinning and is across a broader range.

17. Other programmes which we consider of strategic merit include research in molecular recognition; membrane functions; "smart" optics; transgenic animals; radiological protection; environmental microbiology; and ocean flux. These and others not listed here offer pay-offs both in terms of potential future applications of benefit to the UK and because they will increase strategic leverage in the

management of our total research effort.

18. Allied with this shift to programmes of strategic research, some relief will be needed on the chronic equipment problems to which we have drawn attention in each of the last three years. In many cases research teams, including those doing work of the highest international standard, are struggling with relatively unsophisticated equipment or are unduly restricting parts of their research in order to buy state-of-the-art equipment for other aspects. Councils' investment has necessarily been massively less than the 10% a year increase in equipment expenditure which the recent US National Science Foundation study found to have been necessary for work at the frontiers of science. The SERC knows of specific instrumentation deficiencies which would cost £23 million to remedy and considers that at least a further £45 million is necessary for targetted re-equipment of the country's best university research groups.

Research Council Restructuring

19. In parallel with the necessary reshaping of university research, through the establishment of URCs and more directed programmes of strategic research, it will be important to make further progress with the restructuring of the Research Councils' own establishments. A great deal has been achieved by the Councils in recent years in strengthening central management, bringing related work together, promoting greater effectiveness and reordering research priorities. In particular the upheavals faced by the AFRC and NERC, which are shedding about a third of their manpower, have few parallels in the public sector.

20. Further effort is, however, necessary both to ensure that all areas have been adequately reviewed and to make certain that the maximum scientific and financial benefits are gleaned from the restructuring already undertaken. Councils have an ongoing commitment to this and the Board will do what it can, through the use of its Flexibility Margin and otherwise, to encourage progress. However, in some areas the rate of change which can be achieved within existing levels of provision is too slow. Additional funds are needed to ensure that the objectives of reorganisation can be met on a reasonable timescale and without undue disruption to the priority research programmes it is intended to strengthen.

21. The major need is for capital funds for the AFRC which has consolidated its work into eight new institutes. Several of these are managing research on a variety

of sites and substantial further gains in effectiveness could be achieved through defined programmes of relocation and refurbishment. Significant up-front capital expenditure will be required. The most pressing cases are the Institute of Animal Physiology and Genetics Research, the Institute of Food Research and the Institute of Horticultural Research. Together these would require net additional resources totalling £4 million in 1988-89, £6 million in 1989-90 and £10 million in 1990-91.

22. As we have mentioned in earlier advice, the MRC is considering bringing together the Clinical Research Centre and the Royal Postgraduate Medical School on a single site. This would be a very major undertaking and only possible if the considerable cost were covered by additional resources. The MRC has not yet reached conclusions on the options it wishes to pursue. However, the Council does have firm proposals for smaller rationalisation schemes affecting the Dunn Nutrition Unit, the Experimental Embryology and Teratology Unit, a central animal breeding facility, and permanent provision for clinical NMR spectroscopy. In each case the aim is to increase the effectiveness of existing provision without any increase in costs long term. However, after taking account of off-setting savings from site disposals the MRC needs some £1.5m extra in each of the next 3 years in order to proceed with the schemes.

23. NERC has plans to relocate the British Geological Survey's badly overcrowded geochemical laboratories from inner London to the main BGS site at Keyworth in Nottinghamshire. The capital cost of £4.5 million - for which additional provision would be needed in 1988-90 - would yield much improved facilities and working conditions, valuable closer contacts between related groups of scientists, and would avoid an expected increase in costs of some £0.7 million a year from 1990-91 when existing leases are due for renewal.

24. There are also a number of areas in which Councils' efforts to realise the benefits of restructuring are hindered by the shortage of funds to replace out-dated equipment. In particular, the MRC's units need an extra £1.5 million each year for equipment; and NERC needs £11 million for the re-equipment and rebuilding of its research vessels, and £5 million to maintain and improve the data resources of the British Geological Survey.

25. The plans for all three Councils have been carefully prepared and would yield significant scientific and financial benefits. We recommend that additional funds be made available to allow these valuable restructuring and re-equipment schemes to go ahead.

Developing Scientific Manpower

26. There is a clear need for more explicit and purposeful management and development of scientific manpower - particularly in the physical sciences and engineering. Without this it will not be possible to gain the full benefits we expect from strategic reshaping of the science base. We consider that much of what is necessary could be achieved through the implementation of our proposals for the establishment of university research centres and for more emphasis on programme grants, without adding to the extra costs we have already identified for those.

27. Nevertheless, as we made clear in our Strategy Advice, there is also a need for schemes to enable talented young academics to concentrate on research and to provide longer term support for young researchers not yet in academic appointments. The Royal Society's University Research Fellowship scheme has proved an invaluable means to these ends. The Secretary of State accepted our advice to fund a small expansion of the scheme this year. We and the Royal Society believe that the continuing high quality and number of applicants, and the continuing concerns about manpower, would justify a further expansion providing for the appointment of an extra 25 fellows in each of the next 3 years. We would also recommend a small increase in funds for the Royal Society's Guest Research Fellowship and Japanese Exchange schemes and for the Fellowship of Engineering's schemes to improve scientific manpower in engineering. Together these measures would cost a total of £0.7 million in 1988-89 rising to £2.3 million by 1990-91.

28. There are also particular concerns about clinical and biomedical research manpower. To meet these the MRC has proposed increases in the numbers of its clinical training fellowships and biomedical research studentships and the introduction of a new scheme of career development awards for clinical researchers. The total additional cost of these proposals would be £0.7 million in 1988-89 increasing to £3.5 million by 1990-91.

29. More generally, we continue to be concerned about the availability to the UK science base of top quality scientific manpower. We welcome the recent increases in university academic pay and believe that, together with the better research opportunities which will result from the reshaping of the science base which we recommend, these will reduce the exodus to other sectors of the economy and overseas. However, we consider that the Government should monitor the situation and be prepared to contemplate further action if necessary. The Board is also

concerned about the supply of scientific manpower in the longer term, because of the increasing technological needs of industry and demographic changes in both this country and the USA; we intend to study the prospects in more detail and may have specific proposals to put forward next year.

NECESSARY UNDERPINNING

30. The measures we have proposed to help bring about the necessary reshaping of the science base require that - as a starting point - the Science Budget could support a roughly constant level of activity. This would ensure that existing important scientific programmes can be maintained while giving some scope for the redeployment of funds and effort towards the strategic objectives we have identified. The additional costs identified in previous paragraphs are based on this assumption.

31. However, Science Budget funded bodies have experienced major increases in costs in the last two years - particularly as regards pay and international subscriptions. Providing for these out of previously planned allocations would have required sharp reductions in important scientific programmes. This has been largely but not entirely averted in 1987-88 by the supplementary funding which the Government has made available. For later years, however, the outlook is at present bleak.

Pay

32. The non-clinical academic pay settlement announced in March was for increases of 16.6% from December 1986 and a further 7.4% from April 1988. The agreed restructuring of pay for the scientific civil service is linked with increases totalling about 20% over the period 1986-89. And more recently there has been a settlement in excess of general inflation for clinical academics whose pay is linked with National Health Service scales.

33. We welcome these settlements as a means of retaining and rewarding our best scientists, but the advantage to the nation would be lost if important scientific programmes had to be cut to meet the costs. There was a real risk of such a consequence in 1987-88. However, following representations by the Research Councils, the Secretary of State announced on 1 April that, in view of the particular importance the Government attaches to sustaining the work of the most able scientists and their teams, an additional £15 million would be made available for 1987-88. He added that the consequences for later years would be considered in this year's Public Expenditure Survey.

34. The additional costs which the Science Budget will have to meet as a result

of the pay settlements mentioned above, and the prospective increases for administrative civil servants, amount to about £28 million in each of the next three years. These amounts are much more than Councils could absorb through increased efficiency, or by planned shifts in priorities in the short term. They would require sharp cuts into current programmes (particularly for postgraduate training) and the elimination of any scope for redeployment to new strategic opportunities. The detailed consequences for the Research Councils most affected are set out in the following paragraphs.

35. **AFRC** has already eliminated work classed as desirable, but not of top priority. Further cuts would have to fall on important commodity-based strategic science related primarily to arable crops and livestock. This work has intrinsic merit, and is of distinct interest to industry; indeed it often provides the scientific basis for attracting commissioned, largely applied, work. Examples are: virus diseases of animals, activity of foliar-applied chemicals in arable crops, control of diseases in cereals, biology of weeds and soil pests in arable crops, straw disposal and processing of organic wastes by soil animals. There could be as many as 170 post losses of which half might have to be compulsory and voluntary redundancies at a cost of almost £2 million*. These would follow the total of 1640 posts lost by AFRC in the three years to 1 April 1987. Additionally, new university research grant awards would have to be reduced by about one-third (from 100 to 65) in each of the next two years, thereby reducing priority research on cell signalling, transgenic animals, plant biotechnology, and food research, and implying a loss of 60 research posts in universities.

36. **MRC** would protect its existing long-term programmes, whilst making an almost 50% reduction in 1988-89 in the number of project grants which are often novel proposals submitted by young researchers. Even so, it would also be necessary to cease some 20 longer-term programme grants which became due for review. Work in such areas as the central nervous system, human immune response, addiction research, and genetics research leading to an understanding of hereditary diseases would be stopped; in some cases substantial investment in, for example, clinical trials would have to be abandoned. About 400 posts in universities would no longer be supported. It would also be necessary to reduce by 20% the already inadequate equipment allocations to MRC establishments.

*These figures relate only to AFRC's Science Budget funded work. If funding of commissioned research (mainly by MAFF) were not increased to reflect higher pay costs, there would be an additional 170 losses requiring a further £2 million to implement.

37. **NERC** would in the short term have to forego the increase in research grants to universities which has been planned to raise the proportion of alpha-rated proposals that are funded above the present unacceptably low level of 40%. In the longer term the Council could embark on closures or further contraction of its own institutes. But the contraction already effected - because of the reduction in its grant income and the need to redeploy funds towards university research - has resulted in withdrawal from important areas of science including: cohesive sediments; freshwater algae; toxicant pollution of freshwater; and freshwater fish ecology. Other research of economic and social benefit to the nation would be put at serious risk, and there would be substantial transitional costs arising from redundancies.

38. **SERC** would aim to protect its Directorates and Specially Promoted Programmes, and schemes with industry, although abandoning plans to expand them. Savings would have to be found mainly from research grants to universities, postgraduate training programmes, and central facilities. An illustrative combination of the cutbacks required is:

- a. £5.5m saved by not awarding some 550 research grants (out of 2,400). This would result in the loss of 1,100 posts in universities, and of research in strategic areas such as information technology, materials science, and solid state optics. The proportion of unfunded alpha applications would increase from 30% to 40% over the coming year.
- b. £3m saved by awarding 590 less research studentships (out of 2,650) and 280 less advanced course studentships (out of 2,200) - thereby significantly reducing the output of trained manpower that industry badly needs.
- c. £4m saved by drastic reductions in central facilities such as the Laser Facility, Space and Earth Observation Projects, and the Rutherford Appleton Laboratory's Particle Physics Theory Group; coupled with reductions in the operating time of facilities such as the Nuclear Structure Facility and the Synchrotron Radiation Source. The effect would be a waste of past investment, less efficient modes of operation and severe repercussions for international collaborative programmes.

39. The **ESRC** and other bodies receiving smaller Science Budget allocations will also be affected, and will have to make corresponding reductions in their programmes. For instance, the Royal Society would have to discontinue its university research

fellowships scheme; and the ESRC would have to cut the number of its studentships to below 200 just when its initiatives to improve PhD submission rates are beginning to bear fruit

International Subscriptions

40. The increased costs of international subscriptions - mainly those paid by SERC to CERN, ILL and ESA and by MRC to EMBL and EMBC - have been a major problem, particularly those arising from adverse exchange rate movements in 1986. Substantial reductions in scientific activity have so far been averted; but only by application of virtually all the monies added to the Science Budget for 1987-88 and 1988-89 as a result of the 1986 PES. Although we have not yet recommended how the £20 million addition for 1989-90 should be applied, it is clear that continuing to meet the UK's international scientific commitments would require at least that amount.

41. Our present assessment is that with the application of those additions announced last November, and subject to certain conditions, the cost of international subscriptions will be largely covered. SERC will face a shortfall of £4 million in 1988-89. For later years, however, costs and available resources will balance, provided that:

- a. exchange rates do not deteriorate further;
- b. the costs of CERN are reduced in line with our previous advice;
- c. the subscription to ESA is not increased as a result of the Government's eventual decisions on the British National Space Centre's plan.

If these provisos are not realised, Councils will have to restrict scientific programmes to meet the additional costs. In particular, if the costs of CERN are not markedly reduced it would be difficult to justify continued membership on scientific grounds alone.

42. Taken together the increased costs of pay and international subscriptions mean that on present plans the Science Budget will not be able to provide the necessary underpinning for the major reshaping of the science base which we believe the nation requires. There would be little gain from new strategic initiatives if concurrently the Councils were stopping important current programmes. And the reshaping itself would be the more difficult and costly if Councils lack the flexibility

to redeploy funds and effort towards the new objectives. Additional funding of £32 million in 1988-89 and £28 million in later years - plus whatever further may be necessary if the stipulations in paragraph 41 are not met - is essential to prevent the damage now in prospect. Without such extra provision the necessary reshaping of the science base cannot realistically be pursued.

CONCLUSIONS

43. The Board believes that the UK science base is at a watershed. We are convinced that, for industrial and other reasons, the nation needs a greater investment in science. But the Government's present plans for the Science Budget imply reductions of over 4% in 1988-89, relative to general inflation, and more in later years.

44. We wholly endorse the Government's stated policy of maintaining and enhancing the strength and quality of the science base. The Strategy Advice which we presented to the Secretary of State last month sets out our view of how this should be achieved. A very great deal could be achieved - scientifically and to the UK's economic benefit - as a result of better focussing of research effort through greater selectivity, more purposeful management and more effective links with industry. A substantial start could be made towards the reshaping of the science base which we believe to be necessary by the establishment of inter-disciplinary university research centres, the pursuit of more directed programmes of strategic research, further restructuring of Research Council establishments, supporting manpower measures, and selective re-equipment of our best research teams. The case for these was forcibly argued in our Strategy Advice. This submission develops some of the proposals in more detail and costs their introduction.

45. These thrusts to improve the output of British science must, however, be started from a sound base. A prior condition for the success of the measures we propose for strategic reshaping of the science base will be additional resources to cover the sharp increases in costs faced by the Research Councils. Without increases in the Science Budget on this account, the necessary retrenchment of current programmes and the reduced scope for Councils to redeploy funds and manage new developments will very considerably undermine the possibility of, and the potential benefits from, the major initiatives we propose.

46. The increases in funding which we recommend are summarised in Annex A. We recognise that the total cost of these - £103 million in 1988-89, £131 million

in 1989-90 and £166 million in 1990-91 - is considerable. But so too are the potential benefits to the nation. Our advice to Government is to grasp this opportunity: the alternative of declining scientific activity in an increasingly technological world would seriously prejudice the country's future economic and social development.

CONCLUSIONS

The Board believes that the UK science base is in a weakened state. It is not clear whether this is due to a general decline in the science base or to a specific decline in the science base. The Board believes that the UK science base is in a weakened state. It is not clear whether this is due to a general decline in the science base or to a specific decline in the science base. The Board believes that the UK science base is in a weakened state. It is not clear whether this is due to a general decline in the science base or to a specific decline in the science base.

44. We wholly endorse the Government's stated policy of maintaining and enhancing the strength and quality of the science base. The Strategy Review which we produced in 1991 sets out a number of key areas for action. We believe that the UK's science base is in a weakened state. It is not clear whether this is due to a general decline in the science base or to a specific decline in the science base. The Board believes that the UK science base is in a weakened state. It is not clear whether this is due to a general decline in the science base or to a specific decline in the science base.

45. The Government's Strategy Review sets out a number of key areas for action. We believe that the UK's science base is in a weakened state. It is not clear whether this is due to a general decline in the science base or to a specific decline in the science base. The Board believes that the UK science base is in a weakened state. It is not clear whether this is due to a general decline in the science base or to a specific decline in the science base.

The Government's Present Expenditure Plans

	1987-88	1988-89	1989-90	1990-91
Cash (£ million)	676	673	690	707
1987-88 Prices (£ million)	676	647	641	638
% Change from 1987-88	-	-4.3	-5.2	-5.7

MEMBERSHIP

Increased Funding Recommended by the ABRC

	£ million		
	1988-89	1989-90	1990-91
Necessary Underpinning	32+	28+	28+
Reshaping of the Science Base			
- University Research Centres	10	30	50
- Strategic Research Programmes	24	31	39
- Research Council Restructuring	9	9	11
- Developing Scientific Manpower	1	4	6
Selective Re-equipment*	27	29	32
	103+	131+	166+

(* See paragraphs 18 and 24)

(+ Plus whatever necessary for international subscriptions, see paragraph 41)

estimated at the end of the 1980s to be 15-20% of the total research budget. This is a significant increase on the 10% figure estimated in the 1970s. The increase is due to the fact that the research budget has increased from 1970 to 1980 by 100% and the 1980s budget is estimated to be 15-20% of the total research budget.

The Government's Present Expenditure Plans

	1987-88	1988-89	1989-90	1990-91
Cash (£ million)	570	675	680	707
1987-88 Prices (£ million)	570	647	661	678
% Change from 1987-88	-	-4.2	-2.1	-2.7

Increased Funding Recommended by the ASRC

	1988-89	1989-90	1990-91
Necessary Underpinning	14	14	14
Reshaping of the Science Base			
- University Research Centres	10	10	10
- Strategic Research Programmes	24	21	19
- Research Council Restructuring	9	9	11
- Developing Scientific Manpower	1	4	6
Selective Re-equipment*	17	19	19
	104	107	109

* See paragraph 18 and 19
 + plus whatever necessary for international subscriptions, and
 paragraph 21

THE ADVISORY BOARD FOR THE RESEARCH COUNCILS was established by the Secretary of State for Education and Science in 1972 with the following terms of reference:-

- a. To advise the Secretary of State on his responsibilities for civil science with particular reference to the Research Council system, its articulation with the universities and departments, the support of post-graduate students and the proper balance between international and national scientific activity;
- b. To advise the Secretary of State on the allocation of the Science Budget amongst the Research Councils and other bodies, taking into account funds paid to them by customer departments and the purposes to which such funds are devoted;
- c. To promote close liaison between Councils and the users of their research.

MEMBERSHIP

Professor Sir David Phillips, FRS (Chairman)	- Professor of Molecular Biophysics, University of Oxford
Professor R L Bell	- Director-General of ADAS, Ministry of Agriculture, Fisheries and Food
Sir Walter Bodmer, FRS	- Director of Research, Imperial Cancer Research Fund
Dr R F Coleman	- Chief Scientist and Engineer, Department of Trade and Industry
Professor Sir Sam Edwards, FRS	- Scientific Adviser, Department of Energy
Professor Sir Roger Elliott FRS	- Physical Secretary and Vice President, Royal Society; Wykeham Professor of Physics, Oxford University
Mr J Fairclough, CEng	- Chief Scientific Adviser, Cabinet Office
Mr H Fish, CBE	- Chairman, Natural Environment Research Council
Mr J S Flemming	- Economic Adviser to the Governor, Bank of England
Sir James Gowans, CBE, FRS	- Secretary, Medical Research Council

Sir Douglas Hague, CBE

- Chairman
Economic and Social Research
Council

Professor J P Hearn, FIBiol

- Acting Secretary,
Agricultural and Food Research
Council

Dr M W Holdgate, CB

- Chief Scientist,
Department of the Environment
and Chief Scientific Adviser,
Department of Transport

Professor P Mathias, CBE, FBA

- Chichele Professor of Economic
History,
University of Oxford

Professor E W J Mitchell, CBE, FRS

- Chairman,
Science and Engineering
Research Council

Mr J R S Morris, CBE, FEng

- Chairman,
Brown and Root (UK) Ltd

Professor Sir Richard Norman, KBE, FRS

- Chief Scientific Adviser,
Ministry of Defence

Professor F W O'Grady, CBE

- Chief Scientist,
Department of Health and Social
Security

Dr D H Roberts, CBE, FEng, FRS

- Joint Deputy Managing Director
(Technical),
General Electric Company

Sir Peter Swinnerton-Dyer, KBE, FRS

- Chairman,
University Grants Committee

Sir Francis Tombs, FEng

- Chairman,
Rolls-Royce Ltd; and Chairman,
Advisory Council for Applied
Research and Development

Sir Alwyn Williams, FRS

- Principal and Vice Chancellor,
University of Glasgow

Sir Martin Wood, OBE, FRS

- Deputy Chairman,
Oxford Instruments Group Ltd

Mr R H Bird, CB

- DES Assessor

Mr D W Tanner

- DES Assessor

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15 July 1987

PUBLIC EXPENDITURE SURVEY 1987: THE SCIENCE BUDGET

Thank you for your letter of 19 June submitting the Board's advice regarding the 1987 Public Expenditure Survey as it affects the Science Budget.

I have read this with interest and I am sure it will be helpful in the PES discussions within Government. I recognise that the advice builds on the Strategy Advice which you presented in May, and welcome the further detail you have now provided on some aspects. I note that you will be writing further in relation to CERN.

I am arranging for the ABRC's advice to be published later this month.



Dr. David Phillips

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Dr. David Phillips

Professor Sir David Phillips FRS
Advisory Board for the Research Councils

FRS, MSc, FRCGS, FRCR
12 July 1987

Dr. David Phillips

FRS, MSc, FRCGS, FRCR

Dr. David Phillips

THE SCIENCE ADVICE SURVEY 1987: THE SCIENCE ADVICE

Thank you for your letter of 19 June submitting the Board's
advice regarding the 1987 Public Expenditure Survey as it
relates to the Science Budget.

I have read this with interest and I am sure it will be helpful
in the discussions within Government. I am sure it will be helpful
in the discussions on the Strategy Advice which you presented
in May, and welcome the further detail you have now provided
on some aspects. I note that you will be presenting further

advice for the ARAC's advice to be published later

Dr. David Phillips

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Chairman
Economic and Social Research
Council

Acting Secretary,
Agriculture and Food Research
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Science and Technology
Research Council

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Dr. David Phillips

Deputy Chairman,
Oxford Instruments Group Ltd

DES Adviser

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