



DEPARTMENT OF EDUCATION AND SCIENCE

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FROM THE SECRETARY OF STATE

Andrew Turnbull Esq
Private Secretary to
the Prime Minister
10 Downing Street
London SW1

3 July 1985

Dear Andrew,

**ADVISORY BOARD FOR THE RESEARCH COUNCILS (ABRC): RECENT ADVICE
TO SECRETARY OF STATE FOR EDUCATION AND SCIENCE**

I attach for reference a copy of the full text of the ABRC's recent advice to my Secretary of State "Science and Public Expenditure". A summary of this advice is enclosed with my Secretary of State's letter of today's date as background for the enlarged E(A) discussion of R & D priorities to take place on 10 July.

Copies of this letter and its enclosure go to Private Secretaries of all Ministers who will be attending the E(A) discussion on 10 July.

Yours,

Elizabeth

MISS C E HODKINSON
Private Secretary

**SCIENCE AND
PUBLIC EXPENDITURE
1985**

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

ADVISORY BOARD FOR THE RESEARCH COUNCILS

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.

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TO THE CHAIRMAN OF THE ABRC

SECTION 'A'

MEMBERSHIP OF THE ABRC

- | | |
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| 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 |
| Dr W F Bodmer, FRS | - Director of Research,
Imperial Cancer Research Fund |
| Sir Henry Chilver, F.Eng, FRS | - Vice-Chancellor, Cranfield Institute
of Technology; and Chairman, Advisory
Council for Applied Research
and Development |
| Mr H Fish, CBE | - Chairman, Natural Environment
Research Council |
| Sir James Gowans, CBE, FRS | - Secretary, Medical Research Council |
| Sir Douglas Hague, CBE | - Chairman,
Economic and Social Research Council |
| Dr M W Holdgate, CB | - Chief Scientist and Deputy
Secretary, Department of the Environment
and Chief Scientific Adviser,
Department of Transport |
| Dr A T James, CBE, FRS | - Non-Executive Director,
Wellcome Foundation |
| Professor J L Jinks, FRS | - Secretary, Agricultural and Food
Research Council |
| Sir John Kingman, FRS | - Chairman, Science and Engineering
Research Council |
| Sir James Lighthill, FRS | - Provost, University College, London |
| Sir John Mason, CB, FRS | - Treasurer of the Royal Society
Pro-Chancellor of the University
of Surrey |
| Professor P Mathias, CBE, FBA | - Chichele Professor of Economic
History, University of Oxford |
| Mr J R S Morris, F.Eng | - Chairman, Brown and Root (UK) Ltd |
| Sir Robin Nicholson, F.Eng, FRS | - Chief Scientific Adviser,
Cabinet Office |
| Professor R O C Norman, FRS | - Chief Scientific Adviser,
Ministry of Defence |
| Professor Sir Desmond Pond | - Chief Scientist, Department of
Health and Social Security |

Dr D Pooley

- Chief Scientist,
Department of Energy

Dr D H Roberts, CBE, F.Eng, FRS

- Director of Research,
General Electric Company

Mr O Roith, F.Eng

- Chief Engineer and Scientist,
Department of Trade and Industry

Sir Peter Swinnerton-Dyer, FRS

- Chairman, University Grants Committee

Sir Alwyn Williams FRS

- Principal and Vice-Chancellor
of the University of Glasgow

Mr M F Wood, OBE

- Deputy Chairman,
Oxford Instruments Group Ltd

Mr R H Bird, CB

- DES Assessor

Mr D W Tanner

- DES Assessor

SECRETARY

Mrs H M Williams

The Rt Hon Sir Keith Joseph

25 April 1985

ABRC: 1985 PES ADVICE

1. You have now seen the Board's advice on the implications of last year's PES settlement for civil science within your field of responsibility. I hope that you will be ready to consider publication of the advice, at an appropriate time.
2. In the first part of its advice, the Board has sought to quantify the effect of the Government's cash plans for the Science Vote - looking back to 1981 and forward to 1990 - on the volume of research which the Research Councils can support. This analysis needs to be extended and refined (further work is in hand) but I am confident that the Board's present estimate, of a 10% reduction in the volume of research activity during the 1980s, does not overstate the effects of the Government's expenditure policies. Indeed the probability is that it is an understatement.
3. It might be argued that a reduction of this order over a 10 year period should be manageable and that within a total Vote of £600m it should be possible to protect top priority work and ensure that it is the lowest priority work in terms of quality and economic relevance which is squeezed out. Paragraphs 7 to 11 of the Board's advice and Annex B show that the Research Councils are very much alive to the need to keep their various activities under review and that they have already made substantial changes in the allocation of their resources. The preparation of Corporate Plans will ensure that the process of sharpening priorities, redeployment and critical appraisal of effectiveness is kept to the fore.
4. Why then does the Board conclude that without a substantial injection of additional funds - £15m (2.5%) rising to £40m (6.5%) over the PES period - the Science Vote will be unable to respond to the challenge of supporting research of strategic importance to the economy? The following points are relevant in answering this question:-
 - 1) we are in a period when the pace of development of science and technology is particularly rapid. The UK must be more selective than hitherto about the fields of science in which it seeks to keep up with international competition. But it is unrealistic to think that we can withdraw altogether from other areas: we need people trained in research across a broad front if we are to be in a

position to build on advances made in other countries; the increasing importance of inter-disciplinary research is a further argument against restricting our research effort to too narrow a base;

ii) it is the growth points of science and technology which typically attract some of our brightest minds. If the Science Vote is too constrained to offer them quickly enough opportunities for pursuing their research, they will take up appointments abroad, a situation which allows other countries to capitalise on our investment in their education and training. The Board is under the firm impression that we are losing our brightest scientists at an increasing rate; and,

iii) our major industrial competitors are increasing their investment in research particularly in strategic areas of importance to industry. We cannot keep up with our competitors if we rely on redeployment (which takes time) to release the necessary resources to pursue new opportunities. The growing interdependence of science and technology; the shortening of the timescale between advances in fundamental science and technological applications; the increasing awareness of scientists and industry the world over of the commercial potential of research; all these factors are likely increasingly to inhibit the free circulation round the world of the results of scientific research. Does the Government want the UK to rely increasingly on importing new technology products and processes from abroad?

5. It might be argued that however much we spend as a country on research and however well it is directed to areas of potential importance to the economy, we shall not get a return on it because foreign rather than UK firms will exploit the results. Against this it can fairly be pointed out that great strides have been made in recent years in this country in building bridges between academic research and industry. The SERC's various collaborative research programmes with industry have been notably successful. The "Cambridge Phenomenon" documents the close links between Cambridge University and the high-tech companies which have grown up in the surrounding areas. It is a major concern of the Board to ensure that research findings are exploited by UK industry.

6. The Board has a number of studies underway which we hope will reinforce our general case. These include as noted above more detailed work on trends in the cost of research; documentation of the brain drain; further consideration of the health and influence of British science in various key subjects; and a study of relative expenditure on civil research in the UK, France, Germany and the Netherlands. Some of the results of these studies should be available in time to inform your bilateral discussions in September - if not before. In the meantime, I am very ready to discuss with you any points you have on the Board's present advice, as submitted.

DAVID PHILLIPS

1985 PUBLIC EXPENDITURE SURVEY
- ABRC ADVICE TO SECRETARY OF STATE

INTRODUCTION

1. In the advice we submitted last December "Further Advice on the Science Budget 1984" we expressed gratitude for the additional resources which the Secretary of State had deployed to the Science Budget for 1985-86 and the two succeeding years. We said that the additional funds would broadly maintain level funding as between 1984-85 and 1985-86; and that much valuable scientific activity that had been at risk would now go forward. The new money in 1985-86 will be used, as we advised, for three main purposes: restructuring (£6.5m); major equipment and facilities (£4.5m); and increasing the acceptance rate of university research grants (£3m in 1985-86 rising to £8m in 1987-88).

2. But we also had to advise that these additional funds, were not adequate to sustain beyond 1985-86 the level of investment in civil research which in our judgement was needed to maintain the UK's economic competitiveness. We have since been giving further thought to the underlying implications for the Science Budget of last year's PES settlement; and the present submission offers our advice. It examines more closely the scale and nature of the various factors which are eroding the value of the Science Budget; considers the consequences for the nation's basic research capacity of allowing the erosion which we observe to continue unchecked; and presents our case for greater protection in line with the Government's stated aim "to maintain and enhance the quality of research" (Cmnd 9428 Vol II).

SCIENCE BUDGET TRENDS

3. We recognise that within the context of the Government's public expenditure policy the Science Budget has enjoyed a measure of protection. If allowance is made for inflation using the Treasury GDP deflator, it **appears** that the Science Budget has grown by some 6% in volume in the 4 years 1981-82 to 1985-86 (see Table 1). Even taking account of the fall in this period of Science Budget bodies' other income (mainly from commissioned research) the total resources available to them **appear**, on a similar basis, to have grown, by some 4%.

4. However, the Research Councils' costs have been growing significantly faster than the general level of inflation indicated by the GDP deflator. In 1985-86 for example the Research Councils as a whole face increased costs of at least £20m or 3% above the general level of inflation (see Table 1, Annex A). If these additional costs are taken into account, the 1985-86 Science Budget figure represents a decrease in volume terms of about 1% over the 1984-85 provision.

5. We have looked back at the volume trend in the Science Budget since 1981-82. If allowance is made for the increased costs of foreign exchange, superannuation, restructuring and scientific equipment, the aggregate reduction in this period in the resources available to buy science appears to be about 3%. When account is also taken of certain other cost increases which have been widely perceived but not yet quantified (notably increases affecting materials and consumables) the real reduction in the resources at the disposal of the Councils from the Science budget since 1981-82 appears to be some 5%. Within this average, the effects of under-indexation have varied unpredictably as between Councils and as between years. This, and the constraints

TABLE 1

SCIENCE BUDGET 1978-79 TO 1985-86 AT CONSTANT PRICES¹

	1978-79	1979-80	1980-81	1981-82 ²	1982-83	1983-84	1984-85	1985-86
								£m Cmnd 9428
Science Budget	503	494	481 ⁴	502	503	516	525	534
Index				100	100.2	102.9	104.6	106.4
Other income ³	96.5	97.3	100.8	104.8	103	99.7	94.7 ⁵	96.9 ⁵
TOTAL	599.5	591.3	581.8	606.8	606	615.7	619.7	630.9
Index	100	98.6	97.0	101.2	101	102.7	103.4	105.2
				100	100.1	101.5	102.1	104

1. Average 1983-84 prices, using the GDP deflator.
2. Figures adjusted for transfer of commissioned research funds this year from DHSS and SHHD to MRC.
3. Mainly (75%) from commissioned research funded by Govt departments.
4. Provisional figure, being checked with Treasury.
5. Estimated figures.

TABLE 2

SCIENCE BUDGET CMND 9428 FIGURES

		1984-85	1985-86	1986-87	£m cash 1987-88	1988-89*
1.	Science Budget	550	584	599	613	629
2.	Index	100	106 100	102.5 100	102.5 100	102.5
3.	Treasury pay & prices factor in (1) %		3.5	3	2.5	?

* Provisional figure based on rolling forward 1987-88 provision (including net addition of £8m from 1984 PES) assuming overall pay and prices factor of 2.5%.

of annuality, have made forward planning for orderly retrenchment the more difficult. Particular problems have been caused by fluctuations in the sterling exchange rate which directly affects more than 10% of Science Vote expenditure. Over the same period, overall funding for the universities through the UGC has been reduced by about 8% in real terms. Many commentators believe that the funds available for research in the universities have been cut back disproportionately.

6. Between 1985-86 and 1986-87 and between 1986-87 and 1987-88 the Government's plans for the Science Budget allow for inflation at an annual rate respectively of 3% and 2.5% (see Table 2). While the Science Budget bodies will make every effort to contain their costs within this allowance, to a large extent the costs are outside their control. Annex A gives an account of some prospective cost increases that can be quantified. The arithmetic in Annex A (Table 1) implies that to maintain the current (1985-86) volume of research activity the present cash provision for the Science Budget would need to be increased by at least some 2% (£12m) in 1986-87 and by approximately 1% p.a. thereafter (assuming no further decline in the real value of sterling from 28 March 1985). Without an increase of this order, the volume of research activity is likely to fall by at least a further 4% between 1985-86 and 1988-89 making a total reduction over the decade as a whole of approaching 10%.

THE RESEARCH COUNCILS' RESPONSE

7. In response to this erosion in the value of their Science Budget allocations, the Research Councils have reviewed their priorities and reduced programmes and manpower. By 1987-88 the number of staff directly employed by the Councils will have fallen by over 2,000 since 1981-82 (20%).

All the Research Councils and the BM(NH) are this year to produce Corporate Plans (the second such plan in the case of the AFRC) entailing systematic review of priorities, programmes and organisation and the production of a strategy for the future.

8. The SERC which accounts for half of the Science Budget, is currently undertaking a review of its long-term strategy which has involved all its Boards' assessing their priorities against explicit criteria and using a zero-based budgeting approach (that is starting with a clean sheet and "restoring" activities in order of priority). Since 1981-82 SERC has shed 70 posts and redeployed 250 staff and generally become more selective in its research support. The Engineering Board has for some years focussed research on strategic areas in which broad medium term goals can be discerned; in recent years the Science Board has increasingly given priority to basic science in areas most likely to benefit industrial applications. Over the last decade, the proportion of SERC's budget devoted to "big" science (nuclear physics, astronomy and space research) has dropped from over 70% to 40% and the proportion devoted to engineering has increased from 10% to over 25%.

9. The MRC (20% of the Science Budget) has shed 228 posts since 1981/82. Redeployment of staff between establishments takes place on a continuing basis. Since April 1981 the Council has closed 8 of its research units (out of a current total of some 60) and set up 6 new ones. Two further units are due to be closed, and one set up, in 1985/86. The MRC has recently taken steps to ensure that the question whether work of acknowledged quality could be done at less cost is more explicitly addressed by the Council's peer review procedures. In producing its Corporate Plan, the MRC will be reviewing priorities across its entire portfolio of research.

10. The NERC (13% of the Science Budget) has shed 450 posts (14% of staff) and closed 8 sites since 1981-82. Total staff have declined by only 400 because of an increase of nearly 50 posts (mostly on short-term contract) for expansion of Antarctic research. Proportionately greater economies have been made in equipment and other recurrent budgets. NERC have recently published their Corporate Plan which outlines a major reorganisation of the Council's structure so as to coordinate university and in-house research more closely and to focus research priority and resource allocation determination more sharply. The Plan envisages shedding 300 posts in 1985-86 and a further 600 posts over the following four years (a reduction of 30% in staff). A detailed appraisal of research priorities is now in progress to identify which research can be maintained with the reduced staff numbers.

11. The AFRC (10% of the Science Budget) are in the process of implementing significant reductions in certain areas of research. By 1987-88 these will have involved the loss since 1981-82 of 1550* posts (25%) and the closure of 3 research Institutes. These reductions were foreshadowed in the AFRC's first Corporate Plan which reviewed the scale and balance of research activity in the light of financial constraints on the Council and agricultural over-production.

12. Annex B to this advice offers more detailed notes on the steps being taken by the Research Councils to redeploy resources and increase their flexibility and efficiency.

* excluding any reductions consequential on the reductions of MAFF commissioned research announced in this year's Public Expenditure Paper.

IMPLICATIONS FOR BRITISH SCIENCE

13. The measures described above have helped the Research Councils to adapt to the real reduction in funding which they have experienced since 1981-82. It might be thought that over this period Councils should have been able to absorb a reduction of this order without too grave consequences. However a substantial part of Councils' expenditure is tied up necessarily in long-term commitments. As a result disproportionate economies have had to be made in other areas. Although Councils are seeking to reduce their commitments the rate at which they can do this without incurring substantial redundancy costs is not fast enough to avoid the need for many economies which are essentially short-term cost cutting expedients.

14. These pressures are such that some existing programmes and facilities are seriously under-funded and new areas of research cannot be properly developed. Notably, in 1984-85 the Councils as a whole were unable to fund about one third of the alpha quality research proposals from higher education. SERC's large new facilities, which support a wide range of research activities, cannot be exploited fully (and opportunities for international collaboration are being lost) because the Council cannot afford the instrumentation required. Nor, for example, can SERC meet its agreed share of the cost of the programme of collaborative research with industry in information technology.

15. MRC is likewise overcommitted. It faces pressing demands for renewal and upgrading of capital equipment from its existing units and institutes. For example, the Laboratory of Molecular Biology, which is a world leader in molecular biology can only be given about half the funds it needs to buy top priority state-of-the-art equipment.

The Council is seeking to develop programmes in a number of key areas for the future: in all these areas MRC is attracting some funds from industry and charitable foundations but capital investment and equipment is nonetheless only possible at a minimum level.

16. A number of NERC's existing commitments are under-funded to the point of ineffectiveness. The current level of success for alpha-graded applications is 35% to 40%. Many projects in NERC institutes now lack adequate provision for equipment, materials and recurrent expenditure. New initiatives are also curtailed. Thus NERC does not have the resources to fund full UK participation in the Ocean Drilling Programme which is of fundamental importance to advances in knowledge of plate tectonics and mineralisation. Other constrained areas are deep geology, geodesy, ocean processes, shelf seas research, atmospheric processes, biotechnology, environmental pollution studies (eg acid rain) and remote sensing applications.

17. The AFRC's acceptance rate of alpha-quality applications for research grants has already fallen to 57%. The equipment budget for 1986/87 will be only about one-third of the level of previous years. The planned rate of increase in strategic food research is threatened. The AFRC's second Corporate Plan just issued, shows a reduction in the rate of increase in support for research in universities, colleges and polytechnics.

THE CASE FOR ADDITIONAL RESOURCES

18. We asked the Science Vote bodies to identify research which is threatened given the present planning figures. The total value of the bids they put forward on this basis amounted to £40m in 1986-87 rising

to £70m in 1988-89. We have selected from these a shortlist of areas and programmes which we regard as particularly vital. In drawing up our list, we gave weight to the following factors:-

- a) the potential in the medium term for results of application to UK industry; scope for collaboration with industry in undertaking the research;
- b) extent to which proposals would stimulate research (and research training) in the universities through the provision of equipment and facilities;
- c) extent to which proposals would bring together different branches of expertise relating to separate scientific disciplines (in virtually all fields, the joining together of different scientific streams is becoming increasingly important for advance).

Strategic research

19. The bids on our shortlist fall into 2 broad categories. The first comprises proposals for coordinated research programmes based largely on university research groups and in many cases also directly involving industry. The SERC for example needs additional funds over the PES period to enable it to establish (or expand existing) special programmes with wide ranging industrial potential. These include **low dimensional structures** - precisely tailored materials consisting of layers of atomic scale thickness which are expected to display novel properties and will have a wide range of industrial applications, particularly in electronics; **chemical sensors**, the development of which could revolutionise the

monitoring and controlling of industrial processes; **protein engineering**, the next step beyond genetic engineering which will be of considerable interest to the biotechnology industry; **optoelectronics**, the technology flowing from which will affect a wide variety of information disseminating activities.

20. In some of these areas there is some uncoordinated work going on in the universities but it needs to be drawn together, linked (with DTI's help) to industry and provided with access to the necessary equipment and facilities. In other areas (eg optoelectronics) SERC already have a programme (jointly with DTI) but additional funds are required to take the work forward.

21. NERC also have a cogent case for expanding their support of strategic work in areas of potential economic importance. For example the Council has launched a special programme to stimulate research aimed at increasing fundamental knowledge in the field of **atmospheric chemistry**: further work in this area is needed to enable scientists to understand the processes leading to acid deposition, one of today's most pressing environmental problems. NERC is also seeking to develop its successful but highly capital intensive **deep geology** programme which has great potential for the identification and extraction of the UK's natural resources. A further important NERC initiative is the application of **biotechnology** to the life sciences: this is likely to lead to the identification of organisms and processes with significant industrial applications.

22. The MRC is currently seeking to pursue a number of major initiatives including establishment of a **collaborative research centre** for industrial

academic and clinical partners (the intention is that the centre will in due course be self-financing but £1m to £2m will be needed in each of the next 2 years to set it up); establishment of a multi-disciplinary laboratory in Oxford for **clinical molecular biology** needed if the UK is to capitalise on the substantial investment already made in the field of molecular biology; and establishment in Cambridge of a **Molecular Neurobiology Unit** to investigate at the molecular and genetic levels the structure and function of receptors and transmitters in the nervous system.

23. In **agriculture** and **food**, molecular biology, biochemistry and biophysics are providing new understanding and new potential for the manipulation and management of crop plants, farm animals and industrial micro-organisms. In addition electronics makes possible crucial improvements in measurement and control. Exploitation of these opportunities offer the prospect of major technological advance in the agricultural and food industries. In the light of the strategy set out in its first Corporate Plan the AFRC is seeking to build up its programmes in these areas.

24. The total cost of enabling the Research Councils to pursue effectively special initiatives and programmes of the kind outlined above is £10m in 1986-87 rising to £20m in 1987-88 and £30m in 1988-89.

Central facilities

25. The second broad category of bids on our shortlist relate to central facilities for the research community which are mainly the responsibility of the SERC. We estimate that to complete and maintain central facilities in the UK and to provide access to certain important international facilities and programmes will require additional funding of £5m in 1986-87 rising to £10m thereafter. Facilities such as the Synchrotron Radiation Source (SRS) and the Spallation Neutron Source (SNS) serve

a wide range of basic and strategic science including industrially oriented research. Completion of the SNS is behind schedule and both it and the SRS lack much of the instrumentation required if they are to be fully used. Additional funding is needed to complete construction of the La Palma and Hawaii telescopes (on which expenditure of £30m has already been incurred); and for membership of the European Synchrotron Radiation Facility and the USA-led Ocean Drilling Programme. SERC may also need to contribute financially within the PES period to the next generation of advanced computing facilities for research.

26. The total additional funds which we recommend that the Secretary of State seek in this year's PES are thus:-

	£m cash		
	1986-87	1987-88	1988-89
Strategic Research	10	20	30
Central Facilities	<u>5</u>	<u>10</u>	<u>10</u>
	15	30	40

GENERAL FUNDING OF RESEARCH THROUGH THE UGC

27. We understand that the UGC has put forward a separate bid for additional provision of £45m over the PES period to strengthen the science base in the universities. Most of this is to remove and replace obsolescent equipment and to enhance the UGC's capacity to provide selective support for research teams of the highest quality. We see this bid as essentially complementary to the bid we have put forward.

A substantial proportion of the UK's expenditure on civil science research is financed through the UGC - virtually as much again as the total expenditure on research of the Research Councils. UGC-funded research has probably been reduced in the last few years by more than that supported by the Research Councils (see para 5 above). The effects are evident: in some universities the well-found laboratory no longer exists; and throughout the university system it has become very difficult indeed for even the most outstanding young research scientists to secure research appointments.

28. We applaud the steps which the UGC is now taking to introduce more selectivity into the allocation of its research funds to the universities. This is an essential response to the contraction of the resources available for research, but in any case we believe that improved focussing of the UGC's research funds can very significantly increase the value for money which the country gets from this expenditure. However the UGC will not be able to maintain momentum in its selectivity exercise if it is too constrained by financial pressures. It is idle to suppose that centres of excellence can be built up without adequate funds for equipment and facilities.

29. There will need to be close collaboration between the ABRC and the UGC in the move towards greater selectivity. As well as assisting the UGC, through the Research Councils, to assess universities' strengths and weaknesses in research we expect to offer the Committee guidance on subject priorities. A further area in which there is scope for increased ABRC-UGC collaboration - and perhaps shared funding - is the Royal Society's University Research Fellowship Scheme. The Scheme, though small - 20 new fixed-term posts annually since 1983-84 - has been

extremely valuable in providing untenured research appointments in the universities for very bright young scientists. There is increasing concern in the scientific community about the drying up of positions in the universities for young researchers: this is undoubtedly one of the factors underlying the exodus of outstanding young scientists from Britain for jobs overseas. The cost of continuing the Scheme is likely to be of the order of £0.35m rising to £0.75m by the end of the PES period.

THE ECONOMIC CASE FOR INCREASING INVESTMENT IN SCIENTIFIC RESEARCH

30. We believe that Parliament the Government and the country as a whole are complacent about the current financial straits of the dual support system. In part this complacency stems from a misconception about the role of the Research Councils and about the nature of basic or pure research. It is widely believed that the Research Councils are primarily concerned with supporting pure research which is pursued solely for its own sake. It is also widely believed that pure research is typically research where the chances of discoveries of relevance to the "real" world are remote. Both of these beliefs are false.

31. The origins of the present Research Council system largely go back to war time - 1915 - and the concern of the then Government to harness scientific research to serve practical goals in defence, industry, medicine and social welfare. The SERC and NERC when established 20 years ago took over some of the functions of the Department of Scientific and Industrial Research (DSIR) which, as its name suggests, aimed to promote research of relevance to industry. The continued

concern of all the Research Councils with "relevance" is reflected in the nature of the research which they support: last year we estimated* that less than half of their research expenditure was in support of basic research as conventionally defined. The rest of their expenditure supported either short-term applied research (20%) or research with clear potential, on a longer timescale, for wide ranging applications in industry, medicine and the service sector - so called "strategic" research (40%).

32. The distinction between basic and strategic research is however not particularly helpful for making policy. It erroneously suggests that a clear boundary can be drawn between purely "curiosity-oriented" and "relevant" research. It also encourages the idea that curiosity-oriented, as opposed to more relevant research, is a luxury which the country cannot necessarily afford. But most branches of physics and chemistry are of strategic importance in relation to the engineering and chemical industries; and almost all fields of biology from molecular genetics to mathematical ecology are potential contributors to medicine, agriculture, food processing and environmental management. Science is now so pervasive and the applications of science so widespread that most basic science is relevant to the practical needs of society.

33. A few examples may help to illustrate this point:-

- Solid State Physics: Research on silicon-based materials, gallium arsenide and other semiconductors not only increases our fundamental understanding of the nature of solids but is necessary for underpinning the needs of the electronics industry.

* estimates subject to revision in the light of this year's Annual Review of R & D.

- Biotechnology: The development of the principles and technology for the production of monoclonal antibodies by workers at LMB provides a striking illustration of how basic research can sometimes quite rapidly - and unexpectedly - give results of the greatest practical importance to medicine and industry. Monoclonal antibody to interferon, now produced by Celltech, the world leader in this technology, is sold to some 20 companies worldwide (80% is exported) for the purification of interferon.

- Electro-optics: This continues to be a fruitful area of fundamental research which in the last twenty years has led to the development of the laser industry which produces devices ranging from high-fi equipment to precision machining and surgery.

34. Therefore the view that basic research is in some way dispensable - a luxury to be taken up again when the economy has recovered further and we can afford it - rests on a misunderstanding about the general significance of basic work. On the contrary, our future economic prosperity depends critically on investing adequately and effectively in the research which will produce technologies to be the basis of new industries. It is a truism that the UK is unlikely to continue to be able to compete in industries based on relatively mature technologies which can be easily taken up more competitively by low-wage economies. In large part the level of unemployment in this country reflects the decline of traditional industries. If we are to provide the basis for new internationally competitive industries which will not only provide employment in themselves but which will also generate wealth for people employed in the service sector, we must invest more in research of long-term strategic importance to industry. The timescale and risks associated with this research are such that industry cannot be expected to fund it.

35. It has frequently been said that UK industry is often indifferent to the output of our research institutions and that the benefits of this research are largely reaped by overseas companies. While many cases in the past substantiate this view, we now see a clear trend in which more science-based industry is being promoted actively in this country. It is becoming a significant industrial sector in its own right and is also assisting in the modernisation of the more traditional industries. The Research Councils have made great efforts to build bridges between research and industry through collaborative programmes and other ventures and continue to give high priority to promoting technology transfer.

36. It might be argued that the UK should follow the example set by Japan in the 1950s and 1960s. But it appears that Japan is no longer content only to exploit discoveries and inventions that have been made elsewhere. In recent years it has been making a systematic effort to be first in basic research with potential for developing new technologies. The pace and sophistication of scientific and technological advance is now such that one cannot normally rely on making a commercial success of copying innovative technology unless one has people with research training in the related basic science. For example, an advanced technology such as genetic engineering cannot be brought in without a strong domestic capability - knowledge, skills, trained people, active researchers - in the corresponding advanced sciences such as molecular biology. Molecular biology is one of the fields in which we are losing our brightest young scientists to other countries (especially the USA) because of the lack of research opportunities here. We note the recent announcement of additional resources for science and technology places in higher education but would observe that the Research Councils are unlikely to have the capacity to provide for the growth in research

training and opportunities which will be needed for the increased numbers of students progressing to the postgraduate stage.

SUMMARY AND CONCLUSIONS

37. This submission has argued that the Government's policies have implied and will continue to imply real terms reductions in the resources available to the Research Councils to support research. The year by year reductions in volume may appear to be modest, but the cumulative effect may well be that by the end of this decade the UK's science base could be 10% smaller than at the beginning. If account is taken of pressures on the funding of university research through the UGC the overall reduction in our basic science capability may be greater than this.

38. On the whole the Research Councils have responded positively to the financial pressures on them and are seeking to become more selective and flexible. But the steady attrition of their resource base is squeezing out investment in many new and growing areas of science which are crucial to developing the important industries of tomorrow. Clearly there are limits to the scale of the research investment a country the size of ours can afford. We are not arguing that all research should be supported without regard to relevance and quality. However, we find it disturbing that, during a period when the UK's publicly funded investment in civil research has fallen in real terms, there are indications that our major industrial competitors have been increasing their investment. We hope to be in a position to shed further light on this picture in the autumn when we have the findings of a commissioned study on relative public expenditures on civil research in four major countries.

39. We submit that if additional funds of the order suggested in paragraph 26 above for the Science Vote are not forthcoming we shall fall seriously behind other developed countries in the development and application of new technologies. Over the last decade the UK's living standards have been maintained essentially by the exploitation of North Sea oil resources. Within 20 years these resources will have been exhausted and the continued maintenance of living standards will depend on the development of new export opportunities. We can only look forward to these if we invest in and exploit our major resource - our human capital. Over the last 5 years the Government has reduced the level of this investment in real terms - against the trend in other developed countries. The economic and industrial effects on the UK of this may not become obvious for a few more years. However, we would warn the Government that when they do, they are likely to be grave and effectively irreversible.

SCIENCE BUDGET - SOME PROSPECTIVE COST INCREASES

Superannuation

1. Unlike Government departments (whose superannuation costs are borne on the Paymaster General's Vote) the Research Councils are required to pay superannuation costs. These are increasing and are effectively a first charge on Councils' grants-in-aid. In 1983 there were actuarial increases in employers' contributions to two of the funded superannuation schemes used by the Research Councils viz the MRC funded scheme for MRC's former employees and the USS scheme which covers research assistants etc in universities who are supported on Research Council grants. In 1985-86, the increases arising for the MRC in respect of their scheme amount to £0.6m and to Councils generally in respect of the USS to £1.4m.

2. A second component in additional superannuation costs is that the total sum to be paid to their pensioners by those Councils with pay as you go schemes (all except the MRC) are expected to increase each year due to the age of the bodies. The increase here is expected to be of the order of £1m in 1985-86 rising steeply thereafter to £4.5m in 1987-88.

Salary costs

3. The 1985 pay negotiating round seems likely to add to Research Councils' costs over and above the 3% pay factor built into the PES provision. The Councils have no control over and take no part in the

negotiation of civil service and university staffs' salaries but cannot escape the outcome, since their staff are linked to civil service and other public sector pay models. If in each of the 3 years of the PES period these pay settlements exceeded the pay factor by only 1 percentage point (that is, rather less than the outcome over the last 5 years) the total additional cost to be absorbed at the expense of scientific research would approach £10m.

Restructuring

4. Unlike Government Departments, the Research Councils are required to pay for their restructuring costs from the same source (the Science Vote) as their normal expenditure. In 1985-86 some £9m is likely to be spent by the AFRC, the NERC and the ESRC on programmes of early retirement, redundancy and Institute rationalisation which are needed to adjust the size and balance of their programmes to real reductions in their income and to release resources for new priorities. (The figure of £9m takes no account of any additional restructuring costs which the AFRC would be forced to incur in 1985-86 if MAFF's recently announced R and D cuts are confirmed). In 1986-87 estimated restructuring costs (again excluding any costs consequential on the MAFF R & D cuts) are likely to total as much as £11m (£8m AFRC, £3m NERC). The MRC and the SERC are also likely to develop plans for restructuring and further expenditure will be required.

Foreign exchange

5. The SERC estimate that the recent decline in the exchange value of sterling has added £2m to the costs of its international subscriptions and of completing and operating its facilities overseas. The £2m estimate

takes account of the decline of the £ against other currencies up to 28 March 1985: it makes no allowance for any subsequent decline - or recovery. SERC point out that the volatility of the exchange rate poses acute difficulties for them in attempting to manage their Budget. The SERC has already had some compensation for increased foreign exchange costs (in the 1983 PES settlement). The £2m represents costs over and above this. These extra costs, which are unpredictable and wholly beyond their control, have partly offset the new money which SERC received from the 1984 PES settlement for research grants and capital equipment.

Additional equipment costs

6. As science and technology advance the equipment available to pursue research becomes more sophisticated and hence (in most cases) more expensive. There are some exceptions to this rule, notably of course the price of certain kinds of computing facilities has fallen in real terms. In general however in all areas of science research which previously needed only modest equipment now require advanced facilities and techniques and powerful computing. There is of course a quality or productivity gain when new and more sophisticated equipment comes into use: a modern electron microscope for example can magnify objects over one million times to reveal individual atoms and can also provide a chemical analysis of the elements present in the object, achievements impossible in the old electron microscope. However the increases in costs can be very significant: less than 20 years ago the best electron microscope cost about £12,000 nowadays the best electron microscopes cost between £250,000 and £1.5m depending on the type. Without access to the latest equipment and facilities British scientists cannot do world class research and the equipment cost per research worker is increasing

in real terms.

7. The increase in equipment costs is not easy to quantify because of the problem of making like comparisons over time. A study conducted some years ago found real increases ranging between 10% and 20% per annum. A recent study (still in progress) seems to confirm these findings. An additional factor pushing up costs, particularly over the last year or two, has been the decline in the value of the £ (much equipment has necessarily to be imported, mainly from the USA). If 10% per annum is taken as the average real increase in equipment costs, the additional expenditure incurred annually by the Research Councils in this respect would be of the order of £5m.

Summary

8. The cost increases outlined above, which are not comprehensive, are summarised in Table 1 attached.

SCIENCE BUDGET - SOME PROSPECTIVE COST INCREASES ABOVE AVERAGE ASSUMED INFLATION

	£m cash			
	1985-86	1986-87	1987-88	1988-89
1. Increased costs of international subscriptions and of operating overseas facilities due to fall in value of £ between 22 Nov 1982 and 28 March 1985	2	2	2	2
2. Additional superannuation liabilities	3	5	7	9
3. Salary costs in excess of 2.5% pay factor (est)	2.5	5.0	7.5	10
4. Restructuring costs (early retirements, redundancies etc in AFRC and NERC)	9	11	4	1
5. Additional equipment costs (<u>estimated</u> at 10% real increase pa)	<u>5</u>	<u>10</u>	<u>15</u>	<u>20</u>
				Est. figures
TOTALS (rounded) £m	21	33	35.5	42
as % of Cmnd 9428 figures	3.5	5.5	6.0	7.0

EFFICIENCY SAVINGS, FLEXIBILITY AND REDEPLOYMENT OF RESOURCES
IN THE RESEARCH COUNCILS

1. Detailed notes on the steps being taken under these heads have been prepared by the Research Councils and are attached.

2. The information is provided by each Council under three headings:

	Council	Page
- efficiency savings	AFRC	2
	ESRC	5
	MRC	7
	NERC	10
	SERC	17
- cuts and redeployment	AFRC	3
	ESRC	5
	MRC	7
	NERC	11, 15
- increasing flexibility	AFRC	4
	ESRC	6
	MRC	8
	NERC	12

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EFFICIENCY SAVINGS

1 In view of the severe financial constraints being experienced by the Council, great emphasis has been placed on achieving savings through improvements in operational efficiency. This has been a particular objective in recent years and will remain so.

2 Efficiency savings currently being achieved and projected for the future largely stem from the Rayner Review of Support Services in Research Council Establishments, which reported in April 1983. Good progress is being maintained on implementing the recommendations. Some have been achieved and the remainder are being actively pursued within defined timescales.

Examples are:-

- (i) An AFRC Purchasing Co-ordinator was appointed on 1 March 1984. As a result of central contracts placed since then savings in excess of £100K pa are expected with potential further savings per annum of up to £400K.
- (ii) Significant progress has been made towards rationalising institute stores. Review of staffing and procedures are continuing and further savings are anticipated. To date 18 posts (£150K) have been saved with a reduction in the value of stockholdings (£426K) and in the number of stock lines held.
- (iii) Sales of surplus houses and other land and buildings are of the order of £57K in 1982-82, £46K in 1982-83, £640K in 1983-84, £198K in 1984-85 and will continue in the foreseeable future.
- (iv) The scope for regional placement of complementary engineering skills has been reviewed at several institutes. This has resulted in a saving of 3 posts (£30K) and further rationalisation in the future could save up to 6 further posts (£60K).
- (v) Capital investment in energy saving schemes is continuing. Analysis of data submitted by institutes on energy usage and expenditure show savings in excess of £400K in 1983-84. Further savings are expected in the current financial year.

3 The Council is in the process of creating a Management Audit Unit, combining the functions, and modestly strengthening the personnel, of the existing Internal Audit and Management Services teams. This Unit should materially assist the Council in its search for, and subsequent monitoring of, economies and in particular more cost effective systems and procedures in the provision of support services.

CUTS; REDEPLOYMENT

1 Up to 1981-82, the Council had been able to release resources to enable it to undertake projects of special priority for Science Budget funding. These included programmes on biotechnology (mainly in the genetic manipulation area), neurobiology of animal production, reproductive endocrinology, neuropathogenesis, plant growth hormones, photosynthesis, variation in crop yield and human nutrition.

2 However by 1982-83 the Council had entered a period of retrenchment and as a foretaste of the major restructuring exercises which were to follow, had to plan substantial reductions to the research programmes at the Animal Breeding Research Organisation (ABRO) and the Long Ashton Research Station (LARS). At ABRO, the majority of older long-term breeding experiments involving large numbers of animals were eliminated. At LARS, the fruit and hardy ornamental nursery stock programmes were reduced and responsibility for the residue of horticultural work transferred to East Malling Research Station. The effect of the changes at the two institutes included the phased loss of about 160 posts and cuts of over £1m by 1984-85.

3 In 1983-84 the AFRC was advised of the proposals to make substantial reductions in its share of the Science Budget, following which considerable time and effort has been devoted to planning and implementing the restructuring of the Council's establishments and their research programmes. These measures are set out in some detail in the Council's first Corporate Plan (paras 6.4 to 6.11 refer), which was published in December 1983, and the policies have been reaffirmed in the 1985 Corporate Plan (paras 5.2 to 5.13 refer), which was published on 4 March 1985. The major elements are:-

- (i) Nutritional imbalance and trace elements in animals
- reductions of £1m pa by 1985-86
- (ii) Animal nutrition and production
- reductions of £1m pa by 1987-88
- (iii) Infectious diseases of animals
- reductions of £1m pa by 1986-87
- (iv) Arable crop research
- reductions of £2.4m pa by 1986-87, involving the closure of Letcombe Laboratory (March 1985) and the Weed Research Organisation (March 1986)

4 The manpower implications of these and other measures are dealt with in paras 1.6 to 6.7 of the 1985 Corporate Plan, but about 550 posts will have been lost by the end of 1984-85 and a further 650 posts will have to be lost by 1987-88.

5 The priority areas to which funds have been redeployed since 1981-82, particularly in the latter years, are university support, food research and new scientific initiatives. These areas will continue to increase up to and including 1987-88. Full details are contained in the Council's 1983 and 1985 Corporate Plans.

6 Overall the Council is restructuring its programmes to achieve the necessary reductions arising from a smaller share of the Science Budget, and to permit flexibility to redeploy effort into major new initiatives.

INCREASING FLEXIBILITY

1 Detailed financial planning does not extend beyond the current PES period. Considerable long-term commitments, well beyond that period, do however exist in view of the large proportion of the Council's budget which is allocated to the maintenance of research at the Council's institute and units and the grant-aided institutes within the Agricultural and Food Research Service.

2 As indicated in the Council's 1984 Forward Look submission and 1983 and 1985 Corporate Plans, the AFRC wishes to redeploy resources within its Science Budget allocation to allow for increased support for research in universities, new initiatives in plant and animal science and the expansion of food research. Severe financial constraints have limited the Council's flexibility with the result that the rate of increase in university support originally envisaged has had to be reduced (para 5.31 of the 1985 Corporate Plan refers). Nevertheless, subject to adequate additional provision being made to cover the costs of restructuring, it is intended to allocate the following additional sums to priority areas during the period under review:-

	1986-87	1987-88	1988-89
University support	0.2	0.3	0.1
New initiatives	0.8	0.9	0.1
Food research	1.3	0.5	0.2
	—	—	—
	2.3	1.7	0.4
	—	—	—

3 Over the period covered by the 1985 Corporate Plan, ie 1984-85 to 1989-90, increases of 26% in food research, 14% in university support and 300% in new initiatives are envisaged.

4 In accordance with the Council's policy for increasing the number of short-term appointments some, 30 such appointments have been made in 1984-85. Also, at its first meeting in January 1985, the Council's New Initiatives Board approved projects involving 43 short-term appointments to take effect from April 1985. The number of short-term appointments is likely to increase to a level of about 100 by 1987-88. These posts are additional to those short-term appointments supported by outside funding.

5 As the term "earmarked programmes" does not lend itself to uniform interpretation, it, might be simpler to state that the Council is likely to have between 4-5% of its Science Budget available for allocation to new initiatives and new University research grants at the beginning of the 1988-89 financial year.

Efficiency

Nearly 90% of Council's expenditure is incurred through grants/contracts/awards made to other bodies and persons, and this limits the scope for intervention by Council. There is careful scrutiny of the budgets submitted by such applicants and the Council is carrying out studies into the effectiveness of the research which it has funded with grants of different sizes. The main source of savings through efficiency lies in reducing the costs of central administration. Savings have been made in three ways since 1981. In 1982 the committee structure was reorganised and the number of committees/panels was reduced from over 60 to 10 or so, (of which only six are standing committees). This has produced savings of approximately £100K p.a. In 1983/84 a three year plan was agreed to cut Headquarters staff numbers by 30%. This process is on target and the reductions will be completed in 1985/86. In 1985 the headquarters of ESRC will move to Great Portland Street to share a building and services with AFRC. This will save £100K p.a., a good return on the one-off cost of the move - which is about £250K. It is hoped that further ways will be found to develop the use of Common Services with AFRC. From 1 April 1985 further increases in efficiency will be achieved because ESRC's payroll will be handled by the Government's Chessington Centre rather than internally.

Cuts; Redeployment

The main sufferer from cuts since 1981 has been the number of post-graduate awards. The aggregate reduction in support for training over the period has been equal to about 1,400 student years (£6m in 1984/5 cash). In 1981/2 expenditure on research and training was broadly equal: the proportions are now about 60:40 respectively. An equally important shift has been the growth of special programmes whilst protecting the research grants scheme.

These changes in the balance of its activities have been forced on ESRC as a result of cuts in its budget. Nevertheless room has been made for some new programmes and we have pursued our policy for establishing designated research centres, (DRCs). Special programmes include Competitiveness; Changing Urban and Regional Systems; IT in Education; and Crime and the Criminal Justice System. Three new DRCs have been established since 1981 (other than converted units). These are concerned with: Science Policy, Housing Research, and Health Economics. A further one in Social Work is planned and one in industrial structure and efficiency has been discontinued. A three-year postdoctoral fellowship scheme was set in train in 1983 to give some young social scientists of proven ability a chance to undertake sustained periods of research early in their careers at a time when recruitment opportunities were very limited.

Increasing flexibility

ESRC has deliberately sought to ensure that little of its money is committed to particular forms or fields of research over long periods. With the units converted to DRCs, no commitment extends beyond eight years, while 80% to 90% of ESRC's funding for training and research is for three years or less. This means that a high proportion of the resources available in 1987/8 and 1988/9 could, if that seemed appropriate, be used to finance research in new priority fields, or develop new ways of organising research. About 65% of the research budget is committed to earmarked programmes and to research contracts outside the research grants scheme.

MEDICAL RESEARCH COUNCIL

1. Efficiency savings

The MRC has always concerned itself with "good housekeeping", looking critically at initial investments, finding savings in recurrent expenditure, and putting responsibility on management at every level to seek economies. It is, however, difficult to pin-point and quantify such savings one or more years after they have been achieved. It has never before been thought necessary to keep records of savings as such, and economies by line managers are virtually impossible to identify years later. They are not shown up by total figures of expenditure since the money saved on one project will have been invested in another. The Council, assisted by peer-review, has made general judgements about the volume and quality of a team's research relative to the money spent.

The MRC has recently taken steps to ensure that the question whether work of acknowledged quality could be done at less cost is more explicitly addressed by the Council's peer review procedures. Groups reviewing the work of Council establishments will be supplied with more detailed information than heretofore and their procedures will be modified with a view to enabling them to carry out more thorough assessments of cost-effectiveness.

Since April 1981 the ratio of technical and other support staff to scientific staff has fallen from 2.6:1 to 2.3:1. The numbers of support staff have fallen by 9% while scientific staff numbers have risen by 1%.

The Council's Management Services Group assists in the search for economy and improved efficiency by undertaking manpower audit and management services assignments throughout the organisation. Over each of the past three years the Group has recommended net savings on staff salaries of £0.3 - 0.4 m pa. In addition, the Group is undertaking (or has undertaken) a number of O & M studies and work study assignments (some Rayner-inspired) covering building maintenance services, scientific workshops, regionalisation of libraries, and computerisation of purchasing and accounting in the Council's larger units. We are currently contemplating the extension of staff inspection to include all those posts in the Technical category (Technician and Research Officer) not already covered by the Group's present five-year programme.

The Council's four Research Boards are currently undertaking reviews of every field of work (eg cancer, psychiatric disorders, gastroenterology) for which they are responsible ("portfolio reviews"). In the course of these they are considering such questions as the quality and quantity of the work, coverage of fields and the appropriateness of the forms of support adopted for particular programmes.

2. Cuts; redeployment

The Council keeps the work of its research establishments under continuing review. When they are no longer needed or when their work ceases to be of a high enough standard, or when a new director of the required calibre cannot be found, they are closed down. Since April 1981, the Council has closed 8 MRC Units, and 2 more will close in 1985/86. Over the same period, 6 new units have been established - all in association with university departments - and a programme has been set up jointly with SERC for the support of biological research at the Daresbury synchrotron facility. The number of staff in the 8 closed units was 135. Of these, two-thirds either left the Council's service (by retirement, redundancy or resignation) or were redeployed to vacancies in other units. The remaining third either joined the Council's External Scientific Staff to work on approved programmes of research or took up short-term supernumerary posts in other MRC laboratories. The total annual budget of those 8 units was about £2.0m at historic prices, but the actual sum available for redeployment is considerably less in the short-term because of the need to

finance the one-off costs of this restructuring (ie. to cover redundancy payments, premature retirements and the relocation of staff and equipment).

The savings resulting from the two forthcoming closures will be of the order of £0.5m pa by 1985-86 and more in subsequent years; this money will be redeployed to other programmes. In the short-term, it is likely that the closure of the larger of these units (with a staff complement of about 70 at the beginning of 1984) will incur restructuring costs of approximately £0.25m - £0.35m.

Details of the severe cuts imposed by the Council in order to balance income with expenditure in the face of the insufficiency of the 1984/85 grant-in-aid were given in para. 2 of the Council's response to Part I of the Chairman's letter. Para 2.5, referring to research grants to the universities, points out that even those "alpha" grants which were awarded often had to be funded at a level lower than that requested. As an illustration of this, the total value of awarded project (3-year) grants whose tenure began in 1984/85 had to be pruned by 19%.

The broad balance of the Council's support for medical research, of which some 60% goes to in-house activities with the remaining 40% being allocated to research grants and training awards, remains essentially unchanged by the above measures.

3

Increasing flexibility

The Council's commitments can be considered under five different heads:

a) Research grants (1985/86 provision: £40.8m)

This sum covers project, special project and programme grants and includes some £4m for six-year grants to independent institutes (eg. Institute of Cancer Research, London). Some £8m a year will become available in the period 1986/87 - 1988/89 through the fall-in of grants.

b) MRC establishments (1985/86 provision: £65.1m)

There is a contractual commitment to staff in post, but the falling-in of non-tenured posts and natural turnover of staff releases approximately £3.5m per annum. The commitment to other costs (eg laboratory supplies, equipment) is implicit in the commitment to the continued employment of staff, although funding under this head has sometimes been reduced in an emergency. Savings from the planned closure of establishments have averaged £0.4m pa over recent years, and this level is likely to continue.

c) Training awards (1985/86 provision: £6.7m)

Most awards are of 3 year duration, although some - advance course studentships and intercalated awards - are for one year only. The amount falling in each year (excluding intercalated awards) is approximately £2m. The future of the intercalated awards scheme is under review.

d) Accommodation (1985/86 provision: £6.4m)

Some £1.5m - £2m of the total capital and recurrent provision (including repairs and renewals) is not contractually committed at the start of each year.

- e) International subscriptions and administration (1985/86 provision £10.3m)

There is no automatic falling-in of funds.

Salaries are a major component of the Council's expenditure. If the Government's policy of the last three years, whereby pay has deliberately been under-indexed, is continued, then the turnover of resources to provide uncommitted funds for new initiatives is likely to decline as a percentage of total expenditure. This is already happening, in that the number of research and advanced course studentships has been cut by 30% in order to enable the Council to continue to meet existing, longer term commitments. Within MRC establishments Directors are being encouraged to save posts and to use the savings to meet substantial deficits in their allocations for consumables and equipment.

1. Efficiency savings

Achievement of value for money in scientific research is not primarily a matter of reducing costs but of doing the best possible science with the funds available. To this end the Council has stepped up its programme of Visiting Groups and since 1981-82 there have been Visiting Groups to BGS, IOS, ITE, IMER, MBA, SMBA, SMRU, UCPE, RVS and NCS. Reviews of FBA, IOV, IH, BAS and IMB are in hand, and some institutes reviewed since 1981 will be reviewed again in the course of the next two years.

These Visiting Groups have confirmed the continued priority and productivity of many areas of work but in the course of critical appraisal have recommended the closure of some areas of work and expansion of others. These changes have been or are in the course of being implemented.

Efficiency has been improved by closing old, expensive and dispersed buildings and concentrating staff on fewer, properly equipped sites. The most important programme of this kind is the move of the BGS into its new headquarters at Keyworth. Since 1981-82 BGS offices at Princes Gate, Harwell and Leeds have been closed and with the handover of the Geological Museum to the BM(NH) the remainder of the Exhibition Road building has been vacated. The costs of the Exhibition Road building have been rising steeply and we estimate that the move will save around £400k per annum. It is important that the Keyworth programme should be able to continue so that the remaining London offices of the BGS can be vacated leading to cost savings as well as the scientific advantages of bringing the staff together onto a single site.

Three ITE sites have been closed over the period, with staff either leaving or being transferred to other sites. The Unit of Marine Invertebrate Biology has been closed and the Taunton site of IOS is in the course of being closed with staff leaving or transferring to other sites.

The NERC Corporate Plan envisages a considerable reduction in staff numbers over the next few years which is likely to lead to vacant accommodation. As this occurs sites will be closed in order to save their running costs, the remaining staff being transferred to vacant accommodation at other sites.

During the period, Council has taken out of service the 'RRS Shackleton' and is bringing into operation the purpose-built research vessel 'RRS Charles Darwin'. The 'Charles Darwin' will be a much more effective research platform than any vessel Council has previously owned and as compared with the 'Shackleton' will be able to carry 18 scientists as against 12 and have an endurance of 42 days as against 24. Despite this, the 'Charles Darwin' will cost no more to run after allowing for revaluation of the previous 'Shackleton' costs by the Treasury cash factors. The cost per useful scientist day will therefore be considerably less in real terms.

In 1981-82 the Research Vessels 'John Murray' and 'Sarsia' were sold and replaced by the 'Frederick Russell', thus reducing the number of the Council's research vessels by one.

In 1983, along with the other Research Councils, NERC conducted a Rayner scrutiny of support services. The recommendations should lead to savings of about £190k per annum, building up over a few years, and are in course of implementation. In addition, the Council conducts regular management services and audit reviews and has now established an audit committee to oversee and co-ordinate the work of these two units, together with a new technical audit unit which will be concerned with effective use of equipment and technical facilities.

The Council has recently installed in liaison with SERC an administrative computer. The prime purpose of this machine is not cost reduction but to facilitate more effective administration by providing better and quicker management information. However, it is expected that it will lead to some cost savings.

2. Cuts and redeployment

Between 1981-82 and 1985-86 total income, including commissioned research income, has fallen by £7m, a reduction of 7%. During that period staff numbers have been reduced by about 400 posts. The figures by financial years at 1985-86 prices are as follows.

	<u>1981-82</u>	<u>1982-83</u>	<u>1983-84</u>	<u>1984-85</u>	<u>1985-86</u>
Total income £m	100.4	94.6	92.8	92.9	93.7
Staff at 1 April	3392	3299	3241	3121	2992

These figures disguise the fact that additional money was made available to increase the level of expenditure on Antarctic research by about £5m per annum over the period. As a consequence, staff numbers at the British Antarctic Survey have increased by approximately 50 over the period.

As indicated in our note of 5 March, these reductions in income, together with increases in costs, have exerted a severe pressure on our budget and severely affected recurrent expenditure levels available to scientific projects. This is discussed below.

Some examples of redeployment of resources, together with approximate costing, which was prepared for the 1983 Forward Look, are attached as Annex A.

3. Increasing flexibility

The structure of the NERC budget was set out in tables 1 and 2 attached to our submission of 5 March. These and the accompanying explanations are repeated here for convenience.

The structure of the Council's budget for 1985-86 is shown in Table 1. Of the Council's Science Budget income of £67.3 in 1985-86, £12.9 will be spent on research grants, training awards, university units, special topics and ODP which are all Council priorities. £12.6m will be spent on the Antarctic programme, which is a Government priority, and £4.4m on pension costs and voluntary premature retirement. £5.3m will be spent on major capital projects, other than in the Antarctic, mainly the repayments on the 'Charles Darwin', the completion of Phase 1 of the Keyworth project and essential computer replacement. Thus, over half the Science Budget is used on priority programmes or inescapable commitments leaving £32.1m to fund institutes, services and headquarters costs, including fixed costs such as building maintenance. Thus the institutes rely very heavily on the £26.1m of income from commissioned and other sources. The £58.2m available to the institutes and HQ is used as shown in Table 2. Any savings required must also be taken from this £58m.

Over 40% of the expenditure of the whole Council is manpower. The budget of the institutes other than BAS, shown in Table 2, comprises £34m manpower out

of the total of £58m, ie nearly 60%. Therefore, to maintain a proper balance between manpower, capital and recurrent expenditure, at least 60% of the savings should be found from manpower reductions, ie nearly £2m. The maximum rate of reduction which the Council has found feasible by natural wastage without serious disruption of high priority programmes, including commissioned research on which income depends, is about 100 per year. This produces savings of about £1.2m per annum. Fixed costs and commissioned research recurrent expenditure are difficult to change. Thus the main burden of financial pressures in the last 2 years has been felt on the Science Budget recurrent and equipment budgets, which are now around 10% of the Council's total expenditure.

Without cost pressures and income reductions the £1.2m per annum released by staff reductions, together with perhaps half that sum again in recurrent costs, would have become available in each of the last few years as free money. In contrast, our experience has been that these savings have been more than eroded by cost increases (see section 4) with the result that free money has not become available and recurrent budgets and existing projects have been cut to a bare minimum to accommodate any new projects which could not be met by redeployment of existing staff and other resources. We do not see these pressures diminishing and therefore see no prospect of increasing flexibility or the amount of free money without special measures.

One of the purposes of the NERC Corporate Plan is to create a greater degree of flexibility by greater reductions in staff levels over the next two years. This is intended to make funds available which will be redeployed in a more flexible way; for example, into special topic programmes and research grants with a limited life. Whilst staff levels are being reduced recruitment of any kind will be at a minimum but for such recruitment as does take place fixed term rather than tenured appointments will be used to the maximum possible degree.

The extent to which these measures are successful over the PES period depends very critically on the extent to which the flexibility we expect to achieve is eroded by increased costs. The Corporate Plan sets out a target of a £5m increase in direct university support by 1989-90 and this remains our objective.

Most of the major capital programme is committed for a large part of the PES period. Towards the end of the PES period those resources which will become available will need to be deployed to completion of the Keyworth project and research vessel replacement.

RECENT EXAMPLES OF REDEPLOYMENT OF RESOURCES IN THE NERC RESEARCH PROGRAMME

- (i) Reduction in macropalaeontology, traditional descriptive stratigraphy and structure and petrography leading to the development of integrated, interdisciplinary, regional geological surveys (IGS):
- (ii) Reduction of marine geological research on the continental margins in favour of resolving problems of stability and recent sedimentation on the continental slope (IOS):
- (iii) Development of research on ocean modelling by re-direction of £150k to support a new special topics programme (universities and IOS) - area of collaboration with SERC, MAFF and the Met Office:
- (iv) Redirection of some effort (£255k) on the biology of pelagic oceanic communities to develop a new multidisciplinary programme on the vertical flux of organic material through the water column and its ecological, geochemical and geological consequences (IOS):
- (v) Redirection of support (£200k) for survey and whole ecosystems modelling in the Bristol Channel and Severn Estuary to enhance research on physical, chemical and biological processes in estuarine ecosystems (IMER). Development of research on estuarine processes is also supported through provision of £100k for a special topic programme (Institutes and universities):
- (vi) Withdrawal of support (£350k) from a specialised unit of marine invertebrate biology:
- (vii) Redirection of catchment research (£427k) to study the effects of land use change (deforestation and improvement of upland pasture). Extension of interests to include aspects of water quality and sediment movement, and the response of catchments where the winter snow component is important (IH):
- (viii) Development of research on shallow alluvial aquifers, particularly in the semi-arid zone, by redirection of resources from a number of projects including time series analysis, groundwater recharge in chalk and the Système Hydraulique Européen (SHE) model (IH):
- (ix) Reductions in surveys of freshwater invertebrates (£300k), algology (£70k), geochemical studies (£60k), palaeolimnology (£70k), coarse fish biology (£90k). Enhancement of effort on water chemistry, microbiology and biometrics (FBA):
- (x) Reduction of work on viruses of birds in favour of studies of monoclonal antibodies in relation to insect viruses and insect pest control (IOV):
- (xi) Completion of plant growth analysis and redirection of £30k to develop an expanded programme into plant growth physiology:
- (xii) Reduction in applied conservation research (£1m) with redeployment to basic research on ecological processes and ecosystems, and strategic studies of habitat and land management (ITE). Also, additional support (£700k) for research related to forestry including tree biotechnology (universities, ITE):

- (xiii) Maintenance of important research on deposition processes, pathways and effects of air pollutants despite loss of inhouse commissions (universities, ITE):
- (xiv) Enhancement of support and facilities for application of satellite and aircraft remote sensing techniques in environmental sciences by redeployment of £500k (Institutes and universities).

EFFICIENCY SAVINGS

SERC is continually looking for ways of increasing efficiency and effectiveness. The studies which have been carried out in recent years can be divided into three distinct categories - scientific programme reviews, management audit investigations and efficiency studies.

Examples of the first category are:

- (i) Nuclear Structure Physics in the UK (Mitchell Review)
- (ii) Council Space Review (Richmond Review)
- (iii) Long Term Strategy Working Group

The second category include:

- (i) Rayner Review of Stores and Estate Management
- (ii) Staff and audit inspections of many non-scientific areas both at the Central Office and in the Establishments
- (iii) Review of Joint NERC/SERC Reprographics Unit

There have also been efficiency studies into:

- (i) Fuel usage in SERC Establishments and Central Office
- (ii) Impact on the Office and the peer review system of reducing the number of research grant awarding rounds each year
- (iii) An inter-Council Common Services Unit for studentship administration

The Council has progressed rapidly in the fields of word processing, scientific and administrative databases, text transfer between locations (including DES) and with electronic typewriters linked to local and wide-area computer networks.

Although it is clear that many of these studies have led to reductions in expenditure, it is not possible to isolate these savings from other developments (eg programme changes) taking place over the same period.



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FROM THE SECRETARY OF STATE

Sir David Phillips
Chairman
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Research Councils
Elizabeth House
York Road
London SE1 7PH

16 May 1985

Sir David,

ABRC : 1985 PES ADVICE

Thank you for your letter of 25 April enclosing the ABRC report.

I have read this with interest and I am sure that it will be helpful in my discussions on PES.

The final paragraph in your letter described a number of studies that you have underway. I look forward to receiving the results of these studies as soon as they are available.

Emily
Kew

