

1991 public expenditure survey : advice of the Advisory Board for the Research Councils.

Contributors

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Wellcome Centre for Medical Science

8 May 1991

Dear Secretary of State,

PUBLIC EXPENDITURE SURVEY 1991: THE SCIENCE BUDGET

I am pleased to submit the enclosed advice from the ABRC for this year's Public Expenditure Survey.

The Board has undertaken a detailed scrutiny of the programmes which the Research Councils and other funded bodies plan to pursue within their present Science Budget allocations and a careful review of their proposals for activities requiring additional resources. This advice records our conclusions. The most pressing needs for additional funding can be met by allocations from the Flexibility Margin, and there would be significant benefits if you were able to make an early announcement on that. The further needs which the Board has identified are for consideration in this year's PES discussions.

We have been encouraged by the Department to keep this advice brief, and the enclosed document is thus necessarily a summary. We should be pleased to provide you or your officials with more detail: on funded bodies' baseline plans, on the programmes for which we recommend additional funding, or on any other aspect where you consider that more information is needed.

I should, however, draw your attention now to two points not covered in the enclosed advice. The first concerns the planned shift in the balance of the dual support system for which you have announced a provisional PES transfer of £100m a year starting in September 1992. More detailed work by the Research Councils and CVCP indicates that the transfer needs to be up to 50% greater. I am putting forward separate advice on this: the necessary additional transfer in respect of the baseline is not included in the Board's recommended PES bid, but that does take account of the consequences for new programmes.

The second matter concerns the increasing impact on AFRC of its unfunded superannuation scheme - which now accounts for over 18% of the Council's Science Budget spending. The Board considers that this requires fundamental review and that, at the very least, the Government should avoid worsening the problem (potentially by some £2m a year) as a consequence of its planned legislation on Horticultural Research International.

The Board and I look forward to discussing the enclosed advice, and the above points, with you at an early opportunity.

Yours sincerely,

David Phillips

DAVID PHILLIPS

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ADVICE OF THE ADVISORY BOARD FOR THE RESEARCH COUNCILS

Introduction

1. The Government's objectives for DES funding of civil science are:

- to advance knowledge and technological capability;
- to help produce qualified manpower at postgraduate level; and in these and other ways
- to help achieve economic, social and cultural benefits for the UK."

2. This submission identifies the increases in present Science Budget allocations which the ABRC judges to be necessary to secure continued and improved realisation of those objectives. It is based on a careful scrutiny of Corporate Plans and Forward Look documents prepared by the Research Councils, Royal Society and Fellowship of Engineering - including detailed reviews of their present programmes and of their plans to redeploy resources to new activities in the light of scientific advance, emerging opportunities and national needs.

3. The Board expects the Research Councils and other funded bodies to support their highest priority activities within the expenditure plans announced by the Secretary of State. We are confident that they will do so, and we continue to be impressed by the range and quality of the work they support. It is, however, clear from the Board's review that - after making realistic assumptions about inflation - present spending allocations will not permit some high quality research developments to proceed on the scale and at the rate which the national interest demands. These are detailed in this submission: they represent important programmes of prospectively excellent science but either they are of slightly lower priority than the work that can be supported from funded bodies' baseline allocations (which decline in volume over the PES period), or they are held up because of unavoidable limits on funded bodies' scope to redeploy resources from existing commitments.

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Flexibility Margin

4. The highest priorities, among the additional resource needs which we have identified, can be met from the Flexibility Margin. The Secretary of State accepted the Board's recommendation last autumn that - given the extent to which funded bodies (particularly SERC) needed to revise their previous expenditure plans - a larger than usual sum should be retained initially in this unallocated reserve. The Board's review of bodies' new plans now provides a basis for the allocation of most of the Margin. Our recommendations for this are detailed in the following paragraphs. They would provide support for the most important activities which cannot feature in Councils' baseline plans: enabling a selection of the most promising new scientific opportunities to be grasped; and sustaining essential underpinning expenditure on research grants and training through a difficult transitional period.

5. First, however, we advise that £2.2m a year should be put aside from the Flexibility Margin to cover possible increases in EuroPES attribution. We understand that this will be the maximum extra such charge on the Science Budget, and we will offer further advice on the disposition of any residual sum not in the event required for this purpose.

6. Sustaining the Science Base The key foundations of the science base, which will enable it to continue to deliver the highest quality science to the wider national benefit, are: research training, including through the support of postgraduate awards and fellowships; curiosity-driven research, from which new ideas, discoveries and techniques will emerge, supported by responsive mode grants; and those state-of-the-art facilities and equipment needed to support front rank research. In some areas funded bodies' baseline allocations will be insufficient to meet the needs identified by the Board. The following additional allocations would yield significant improvements:

- a. SERC: to offset reductions in responsive grants and postgraduate awards - particularly those cutbacks envisaged in the mainstream areas of physics and chemistry and in control and electronic engineering, due to the financial difficulties involved in the orderly closure of the Nuclear Structure Facility (including honouring commitments under the EUROGAM agreement), and to the cost of instruments promised for ESA's Cassini/Huygens mission to Saturn (grants: £11.8m, £11.7m, £7.8m; awards: £4.0m, £5.8m, £6.9m)¹;

¹ figures in brackets indicate the recommended allocations under each head for 1992-93, 1993-94 and 1994-95 respectively. All sums are additions to spending already planned within funded bodies' baseline allocations.

- b. AFRC: to avoid a 20% cut in planned provision for responsive mode grants, which would have a serious impact since high quality applications have been increasing rapidly in areas of science which the Council supports (£1.1m, £1.5m, £2.0m);
- c. the Royal Society: to sustain the University Research Fellowships scheme, which provides support for a cadre of talented young researchers at the start of their careers (£0.9m, £1.1m, £1.7m);
- d. the Fellowship of Engineering: for the broad support of its portfolio which gains substantially in value through high gearing from other funds (£0.2m, £0.2m, £0.2m);
- e. a new supercomputer for researchers throughout the HEI and Research Council system, which will be capable of handling new and complex models of fluid dynamics and of the global atmosphere and oceans, and of comparable power to the best machines in competitor countries (£5m, £5m, £5m).

7. New Scientific Opportunities There are also a number of high priority strategic research programmes of outstanding promise which would benefit from greater funding or an earlier start than is possible within Councils' baseline allocations. The Board recommends the following enhancements:

- a. MRC: the Genetic Approach to Human Health, building on existing world-class research including work on the mapping and sequencing of the human genome, this programme aims to develop and apply new understanding of biological processes at the molecular level and will have implications both for underpinning basic knowledge and for clinical practice (eg in treatment of cystic fibrosis where a single gene has been identified) (£3.4m, £3.7m, £3.9m);
- b. MRC: Neurosciences, where the Council sees the potential, by focusing on the molecular and cellular mechanisms of brain function, to radically change classical approaches to the understanding of the brain and the diagnosis and treatment of mental illness (on which £4 billion is spent by the NHS every year in ameliorative or short-term treatment) (£2.2m, £2.5m, £2.5m);
- c. Global Environmental Change (GEC), where an increase in basic science is required to address the complex and challenging problem of unravelling the processes and interactions of the physical, chemical and biological systems which constitute our global environment; and where the necessary consultation, coordination and prioritisation of research programmes is being successfully promoted through the Inter-Agency Committee (IAC-GEC):

AFRC: to avoid a 20% cut in planned provision for responsive mode grants, which would have a serious impact since high quality applications have been increasing rapidly in areas of science which the Council supports (£1.1m, £1.3m);

c. the Royal Society: to sustain the University Research Fellowship scheme, which provides support for a cadre of talented young researchers at the start of their careers (£0.9m, £1.1m, £1.3m);

d. the Fellowship of Engineering: for the broad support of its portfolio which gains substantially in value through high grading from other funds (£0.1m, £0.2m, £0.3m);

e. a new supercomputer for researchers throughout the HEI and Research Council system, which will be capable of handling new and complex models of fluid dynamics and of the global atmosphere and ocean, and of comparable power to the best machines in computer centres (£2m, £3m, £5m).

7. New Scientific Opportunities There are also a number of high priority strategic research programmes of outstanding promise which would benefit from greater funding at an earlier start than is possible within Council's business allocations. The Board recommends the following enhancements:

a. MRC: the Genetic Approach to Human Health, building on existing world-class research including work on the mapping and sequencing of the human genome. This programme aims to develop and apply new understanding of biological processes at the molecular level and will have implications both for understanding basic knowledge and for clinical practice (eg in treatment of cystic fibrosis where a single gene has been identified) (£3.4m, £3.7m, £3.9m);

b. MRC: Neurodegeneration, where the Council sees the potential, by focusing on the molecular and cellular mechanisms of brain function, to radically change clinical approaches to the understanding of the brain and the diagnosis and treatment of mental illness (on which £4 billion is spent by the NHS every year for medication or short-term treatment) (£2.5m, £2.8m, £3.2m);

c. Global Environmental Change (GEC), where an increase in basic science is required to address the complex and challenging problem of unravelling the processes and interactions of the physical, chemical and biological systems which constitute our global environment; and where the necessary consultation, coordination and prioritisation of research programmes is being successfully promoted through the Inter-Agency Committee (IAC-GEC).

i. NERC: a supplementary programme on terrestrial impacts of climate change, closely integrated with the work of the AFRC and focusing particularly on: the varying effects on different plants of increases in CO₂; changing risks of pests and disease as ecosystems are disturbed; and the response of natural soils to climate change (£2.9m, £3.4m, £3.5m);

ii. AFRC: priority elements of a programme to increase understanding at the genetic level of the reactions of plants, animals and microbes to the stress of climate change and the consequent wider impact on nutrient and water cycles, particularly in managed ecosystems (£2.0m, £2.0m, £2.0m);

iii. ESRC: socio-economic aspects of climate change, possible responses, and the cost-benefits of international agreements; and the establishment of a centre to manage data on global environmental change (£1.6m, £1.5m, £1.5m);

iv. NERC: a predictive capability, building on UK strengths in global atmospheric modelling, for estimating the rate and scale of stratospheric ozone depletion and to obtain a new understanding of the middle atmosphere (£0.9m, £1.0m, £1.1m);

d. ESRC: development of statistical theory and analytical research tools for Large and Complex Data-sets, with immediate application to work on the 1991 Census and pervasive long term value in developing methodology for all Councils, (£0.5m, £1.2m, £1.4m).

PES bids

8. The early allocation of the Flexibility Margin will enable additional high quality research to proceed and will mitigate the present gloomy prospects for the science base. But it will remain true that the Government's spending plans do not provide for the total Science Budget to be sustained in real terms, and that funded bodies' forward plans project a reduction in activity which will have serious implications for UK science. While the highest priority programmes of exceptional scientific quality will be supported within funded bodies' baselines, only parts of other priority programmes can be started after Flexibility Margin allocations and only some of the undesirable reductions in underpinning activity can be remedied by the resources available. Many promising initiatives of national importance cannot be accommodated at all within the present baseline. The Board has reviewed funded bodies' proposals for additional spending to meet these needs, and has

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- d. ESRC: development of statistical theory and analytical research tools for Large and Complex Data-sets, with immediate application to work on the 1991 Census and pervasive long term value in developing methodology for all Councils (£0.5m, £1.2m, £1.4m).

concluded that the total resources required within the Science Budget to meet the Government's objectives should be increased by the following amounts:

<u>£ millions</u>	1992-93	1993-94	1994-95
Science Budget: Present Plans ²	1022.8	1106.0	1133.9
ABRC total PES bid	93.1	164.0	195.3
Recommended Science Budget	1115.9	1270.0	1329.2

9. This bid, if met in full, would imply a real terms growth in the volume of the Science Budget of 6% in 1992-93, and of 4% over the following two years. The Board is convinced that such an increase would be in the national interest. It would remedy the reduction in the volume of research activity and the decline in the Science Budget as a proportion of national wealth which are implicit in the Government's present spending plans. It would enable the science base to sustain the output of knowledge, skills and trained manpower that the country needs to underpin its continuing economic and social development. And a slightly rising spending profile would provide a better basis for the funded bodies to make forward plans to support high quality science and to avoid wasteful short term interruptions and delays in research programmes.

10. Core activities: a further tranche of funding is needed to supplement present plans for manpower training, responsive research grants and equipment, enabling funded bodies to sustain the essential foundations for high quality research in HEIs and in Councils' own institutes. We recommend the following additions:

- a. SERC: further restoration of the Science and Engineering Boards' research grant resources, for which a reduction of about 20% in real terms is implied by current planning figures largely because of the frictional constraints of the Council's long-term commitments to international subscriptions and major UK facilities. Recurrent support for unsolicited grant applications is essential to the broad development of the science base: almost 4000 research grants were supported by these two Boards in 1990-91, covering an indispensable core of basic and strategic

² Includes provisional transfers in respect of planned change in balance of the dual support system. Parallel ABRC advice on that recommends additional transfer of £25m in 1992-93 and £50m in later years to effect that change without loss in research volumes. The ABRC PES bid has been costed on the post-transfer basis (with grants to HEIs uprated by 55% to cover additional responsibilities for direct and indirect costs currently met from UFC provided funds).

concluded that the total resources required within the Science Budget to meet the Government's objectives should be increased by the following amounts:

£ millions	1992-93	1993-94	1994-95
Science Budget Present Plans ²	1027.8	1100.0	1133.9
ABRC total PES bid	93.1	104.0	105.3
Recommended Science Budget	1120.9	1204.0	1239.2

9. This bid, if met in full, would imply a real terms growth in the volume of the Science Budget of 6.9% in 1992-93, and of 4.7% over the following two years. The Board is convinced that such an increase would be in the national interest. It would remedy the reduction in the volume of research activity and the decline in the Science Budget as a proportion of national wealth which are implicit in the Government's present spending plans. It would enable the science base to sustain the output of knowledge, skills and trained manpower that the country needs to underpin its continuing economic and social development. And a slightly rising spending profile would provide a better basis for the funded bodies to make forward plans to support high quality science and to avoid wasteful short term interruptions and delays in research programmes.

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- SERC: further restoration of the Science and Engineering Boards' research grant resources, for which a reduction of about 30% in real terms is implied by current planning figures largely because of the financial constraints of the Council's long-term commitments to international organisations and major UK facilities. Recurrent support for unsolicited grant applications is essential to the broad development of the science base: almost 4000 research grants were supported by these two Boards in 1990-91, covering an indispensable core of basic and strategic

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science. Enhancement of present allocations would: enable that volume of research to be sustained; allow increased investment in developing areas such as mechatronics, bioelectronics, invertebrate neuroscience and non-linear optics; and support the increasingly necessary provision of sophisticated research equipment in higher education laboratories, eg for nuclear magnetic resonance, protein sequencing and epitaxial growth (£33m, £51m, £52.5m);

12. Medical research

b. AFRC: additional resources for responsive mode research grants and, particularly, for equipment, to enable the Council to move towards the HE support target in its Corporate Plan which will provide a better balance with the Council's Institute activity (£2m, £4.5m, £4.5m);

c. AFRC: capital for the provision of new state-of-the-art instruments in Institutes - particularly DNA sequencing apparatus and electron microscopes for cellular and molecular sciences - which would otherwise be constrained by the need over the next 3 years to spend capital funds on meeting new statutory safety and security requirements (£3.0m, £3.0m, £3.0m);

d. the Royal Society: to maintain the value in real terms of the Small Grants scheme, which is a valuable supplement to the Councils' research grant schemes (£0.3m, £0.5m, £0.5m);

e. ESRC: to help satisfy the expanding demand for trained manpower in the economic and social sciences through selective increases in studentship numbers, capitalising on the improvements in training quality achieved in recent years; and to expand the Teaching Company scheme in the service sector (£0.9m, £2.0m, £4.7m);

f. SERC: Advanced Fellowships, for a 50% increase (to 36) in the present number of these awards, which allow the very best young scientists to concentrate full-time on research (£0.2m, £0.5m, £1.0m);

g. further support for supercomputing, with pilot installations of highly parallel and other novel architecture systems which are likely to become the next generation of powerful dedicated research tools (£0m, £2.0m, £3.0m).

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11. Research Programmes Additional funding is also needed if the Research Councils are to be able to direct adequate support towards some of the exciting and promising scientific opportunities which are emerging. The Board strongly recommends additions for the programmes described in the following three paragraphs.

12. Medical research

- a. MRC: further expansion of the programmes on the genetic approach to human health and neurosciences beyond the limited funds presently available (para 7a and b above). The Board believes that these programmes are of such quality as to merit significant growth, given the scientific strength of existing research teams in these areas and the potential gains for health service provision (genetic approach: £4.1m, £12.6m, £16.1m; neurosciences: £2.3m, £6.2m, £10.7m);
- b. ESRC: an IRC in Urban Health, researching the recognised significance of behavioural and social factors for health, with critical implications for planning health service provision and for health promotion (£0.6m, £1.4m, £1.5m);
- c. MRC: a series of research initiatives in areas of wide public concern: diabetes, with the British Diabetic Association; new developments in medical imaging; and clinical problems where molecular techniques are prospectively applicable, eg arthritis, rheumatism, bone disease and asthma (£5.7m, £10.1m, £12.1m).

13. Environmental research

- a. further underpinning of programmes responding to the priorities identified by the IAC-GEC to make a major, high-quality UK input to the developing international study of the process, impacts and possible responses to climate change (£17.6m, £21.1m):
 - i. AFRC: biological responses to environmental change, particularly formation on nutrient fluxes;
 - ii. ESRC: systematic analysis of the causes and impacts of population changes, by growth and by the migration of refugees from environmental disaster areas;

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- b. ESRC: an IRC in Urban Health, researching the recognised significance of behavioural and social factors for health, with crucial implications for planning health service provision and for health promotion (£0.6m, £1.4m, £1.2m);
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- ii. ESRC: systematic analysis of the causes and impacts of population changes by growth and by the migration of refugees from environmental disaster areas;

- iii. SERC: development of underpinning technologies for satellite instrumentation for ESA and NASA missions, and for laboratory studies of atmospheric chemistry to complement NERC's field studies;
- iv. NERC: a satellite observation programme to complement SERC, and BNSC, programmes, and for enhanced data collection and processing to produce improved global process models;
- b. NERC: Land-Ocean Interactions Study (LOIS), enabling major scientific advances in understanding of the basic processes determining the fate of materials transported between land, ocean and atmosphere, and leading to the development of predictive models as a basis for expert systems on coastal zone conservation and for investigating the impact of sea-level changes (£6.4m, £9.5m, £11.6m);
- c. AFRC, ESRC and SERC: research into the development and use of Cleaner Technologies including biological energy sources, bio-scavengers, the practical implementation of the 'civilised city' concept and an analysis of the barriers to usage and opportunities for export of clean technology by UK industry (£3.8m, £8.5m, £12.3m).

14. Other scientific opportunities

- a. SERC: Advanced Materials initiatives: building on economically important developments in metal matrix composites, ceramics, magnetic materials and engineering polymers. Additional funds would enable Council-sponsored researchers: to develop the applications of scanning probe microscopy, eg to study the surface of semiconductors and to make structural measurements of biological molecules; to stimulate basic research in nanometre (millionth of a millimetre) scale micro-electronics with applications to medicine, opto-electronics and micro-machines; and to expand research into multi-layered organic and polymeric magnetic materials (£12.4m, £22.6m, £26.4m);
- b. AFRC: Intracellular Signalling, an exciting and pervasive subject where UK researchers lead, which aims to understand the fundamental mechanisms of coordination and regulation of chemical signals inside animal and plant cells, such as those that recognise pollen landing on the female stigma and interfere with self-pollination (£2.2m, £3.5m, £4.5m);

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 - b. AFRC: Intracellular Signalling, an exciting and pervasive subject where UK researchers lead, which aims to understand the fundamental mechanisms of coordination and regulation of chemical signals (acid, amino and plant cells, such as those that recognise pollen landing on the female stigma and interact with self-pollination (£2.2m, £2.5m, £4.5m);

- c. AFRC: Image Analysis in Biological Systems, which has been a particular challenge because of the inherently variable and fragile nature of biological materials; recent developments in spectroscopy and computing will allow improved image discrimination and the interpretation of material in its natural state with prospects for development of generic technologies (£1.3m, £2.4m, £3.3m);
- d. NERC: BRIDGE, the British mid-Ocean Ridge Initiative, a scientifically exciting and technologically innovative field of national and economic interest - the programme will focus on those regions of the Earth where new crust emerges, the location for unique high-temperature high-pressure biological communities; on the associated deposition of valuable ores; and on technological developments for work in the deep oceans (£6.0m, £4.8m, £5.2m);
- e. ESRC: 'Managing Change in the public services' will be a multidisciplinary study of the process and outcome of organisational restructuring, the changing roles of clients, managers and professionals, and the needs for new competencies (£0.2m, £0.8m, £0.8m); and the 'European context for science policy' providing support for policy decisions and strategic scientific developments in the EC and in the changing manpower structure of a more mobile Europe (£0.2m, £0.5m, £0.5m).

The Health of the Science Base

15. In its review the Board has been concerned primarily with the quality and scientific significance of funded bodies' programmes. Quality is judged against the ABRC 'internal' criteria for scientific priorities: excellence, timeliness and pervasiveness. But the Board also considers the implications of science base activities for the social and economic welfare of the nation by reference to 'external' criteria - education and training of highly skilled manpower, exploitability and applicability - which are allied to the Government's objectives for its support of civil science.

16. The quality of scientific output affects our potential to develop a technologically sophisticated economic and industrial base, to improve the quality of everybody's health and environment, and to play a proper role in the global forum. The science base is an essential contributor to the welfare of the nation, as well as a beneficiary of the resources that a healthy economy can make available. It is clear, from international comparisons, that the UK science base remains outstanding in efficiency and productivity. But good management and scientific effectiveness alone are unlikely to sustain high quality output without sufficient resources for underpinning activities and facilities. The Board is

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concerned by the consistent indications that the UK share of the world total of scientific publications, and the relative impact of UK publications in important areas of science, continue to decline.

17. Nonetheless, the quality of output of the science base is diverse and impressive. For example, BTG now holds 8000 patents across 1500 technologies with licences to industry leading to annual world-wide sales in excess of £1 billion. Much of this is based on research supported by the Research Councils, including the innovative science which led to cephalosporin antibiotics, pyrethrin insecticides and magnetic resonance imaging body scanners. Basic research, strategic research, applied research and industrial research and development are most productive when they are informed by constant iteration and interaction. The Councils have been taking steps to foster these complex interrelations. This year, for example, the MRC's Laboratory of Molecular Biology at Cambridge won a Queen's Award for Innovation, jointly with Bio-Rad Microscience, for work on the laser scanning microscope. And the ESRC is in the forefront of developing the geographic information systems technology which is an increasingly essential tool for industry and commerce.

18. Encouraged by the Board, the funded bodies have progressively improved their efficiency (as reflected in output and performance indicators), their management and their responsiveness. The latter is reflected in increases in the proportion of staff on fixed-term contracts and in the proportion of their funds spent directly in HEIs. About half the Science Budget is spent on direct support of research in HEIs through postgraduate awards, research grants and units. Less than one-third is spent in Councils' own institutes, and just 5.3% on administration.

19. Expenditure on postgraduate studentships is planned to increase from 11.7% of spend in 1990-91 to 13.5% by 1993-94. The Councils support 56% of postgraduates in full-time research training in UK universities and 27% of those on full-time Masters' courses. Current improvements in training management will be critical for a science base dependent on the highest quality manpower. Recruitment to Council studentships, particularly to industrial collaborative projects, has generally improved following the decision to increase awards' rates. The wider economy will benefit from this, since 70% of those completing training take up appointments outside the science base, and an improved flow to industry will be particularly important.

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20. Planning within the science base depends upon the flexibility which funded bodies have to redeploy resources to new priorities. However, within current plans, funds freed through turnover have largely been absorbed by the need to sustain highest priorities against inflation. The other major constraint, which has had a serious frictional impact on SERC's plans, has been that of long-term, international commitments. The Board welcomes the reviews that SERC has initiated on particle physics and on neutron sources, including its involvement in CERN and ILL, and expects that a more comprehensive planning approach to such commitments will soon be established.

EuroPES

21. The decline in the real value of the Science Budget implied by present planning figures will exacerbate the impact of inflation, VAT changes and frictional costs. Against this, the Board is confident that additional funding would be rewarded by continued furtherance of the Government's objectives. We therefore commend to the Secretary of State increases in the present allocations which will both fund important, targeted areas of exciting new science and restore the capacity for dynamic resource management which is characteristic of a healthy, productive and efficient system.

New Scientific Opportunities

MRC Genetic approach to health	3.4	2.7	3.9
MRC Neurosciences and human health	2.2	2.3	2.3
AFRC Biological Response to Global Environmental Change	2.0	2.0	2.0
ESRC GEC, incl. data facility	1.6	1.3	1.3
NERC GEC Terrestrial impacts	2.9	3.4	3.5
NERC Stratospheric Ozone Depletion	0.9	1.0	1.1
ESRC Large and complex datasets	0.3	1.2	1.4
TOTAL	16.7	13.9	16.7

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31. The decline in the real value of the Science Budget implied by present planning figures will exacerbate the impact of inflation, VAT changes and financial cuts. Against this, the Board is confident that additional funding would be rewarded by continued advances of the Government's objectives. We therefore commend to the Secretary of State Ministers in the present allocations which will both fund important, targeted areas of existing work and restore the capacity for dynamic resource management which is characteristic of a healthy, productive and efficient system.

PROPOSALS FOR ADDITIONAL FUNDING

RECOMMENDED ALLOCATION OF FLEXIBILITY MARGIN

		£ million		
		1992-93	1993-94	1994-95
Core activities				
		£ Million		
		1992-93	1993-94	1994-95
SERC	Science Board grants			
SERC	Engineering Board grants			
AFRC	HFI grants and research groups			
	Small Grants scheme			
EuroPES	Contingency for additional attribution	2.2	2.2	2.2
ESRC	Teaching Company Scheme			
ESRC	Fellowships			
AFRC	Laboratory equipment & capital			
Supercomp	AFRC responsive mode grants	1.1	1.5	2.0
	SERC responsive mode grants	11.8	11.7	7.8
	SERC postgraduate awards	4.0	5.8	6.9
	Royal Society URFs	0.9	1.1	1.7
Medical	Fellowship of Engineering	0.2	0.2	0.2
	Supercomputing enhancement	5.0	5.0	5.0
New Scientific Opportunities				
	MRC Genetic approach to health	3.4	3.7	3.9
	MRC Neurosciences and human health	2.2	2.5	2.5
	AFRC Biological Response to Global			
	Environmental Change	2.0	2.0	2.0
	ESRC GEC, incl. data facility	1.6	1.5	1.5
	NERC GEC Terrestrial impacts	2.9	3.4	3.5
Enviro	NERC Stratospheric Ozone Depletion	0.9	1.0	1.1
	ESRC Large and complex datasets	0.5	1.2	1.4
AFRC	Climate Change: Biological Response			
ESRC	GEC: Populations and migration			
NERC	Satellite Earth Observation	38.7	42.8	41.7
SERC	GEC: Earth Observation/Atmosphere			
NERC	Land Ocean Interaction Study			
AFRC	Cleaner Technologies			
ESRC	Cleaner Technologies			
SERC	Cleaner Technologies			
	Sub-Total	18.7	35.6	
Other scientific opportunities				
SERC	Materials Programmes	12.4	22.6	
AFRC	Intracellular Signalling	2.2	3.5	
AFRC	Image Analysis in Biology	1.3	2.4	
NERC	British Mid-Ocean Ridge Initiative	6.0	4.3	
ESRC	Managing Change in Public Services	0.2	0.8	
ESRC	European Science Policy	0.2	0.5	
	Sub-total	22.3	34.6	
TOTAL PES BID 1991		93.1	164.0	195.1

RECOMMENDED ALLOCATION OF FLEXIBILITY MARGIN

	1992-93	1993-94	1994
Europe2			
Contingency for additional expenditure	2.2	2.2	2.2
Sustaining the Science Base			
AFRC responsive mode grants	1.1	1.2	2.0
SERC responsive mode grants	11.8	11.7	7.8
SERC postgraduate awards	4.0	2.8	6.8
Royal Society URFs	0.9	1.1	1.7
Fellowship of Engineering	0.2	0.2	0.2
Supporting enhancement	2.0	2.0	2.0
New Scientific Opportunities			
MRC Genetic approach to health	2.4	2.7	2.9
MRC Neuroscience and human health	2.2	2.2	2.2
AFRC Biological Response to Global			
Environmental Change	2.0	2.0	2.0
ESRC GEC incl. data facility	1.8	1.2	1.2
NERC GEC Terrestrial impacts	2.9	2.4	2.2
NERC Stratospheric Ozone Depletion	0.9	1.0	1.1
ESRC Large and complex datasets	0.2	1.2	1.4
TOTAL	38.7	42.8	41.7

PROPOSALS FOR ADDITIONAL FUNDING

PRESENT SCIENCE BUDGET ALLOCATIONS

		£ million		
		1992-93	1993-94	1994-95
Core activities				
SERC	Science Board grants	22.0	34.0	35.0
SERC	Engineering Board grants	11.0	17.0	17.0
AFRC	HEI grants and research groups	2.0	4.5	4.0
Royal Society	Small Grants scheme	0.3	0.5	0.0
ESRC	Postgraduate Studentships	0.5	1.2	3.0
ESRC	Teaching Company Scheme	0.4	0.8	1.0
SERC	Advanced Fellowships	0.2	0.5	1.0
AFRC	Institute equipment & capital	3.0	3.0	3.0
Supercomputing enhancements			2.0	3.0
Sub-Total		39.4	63.5	69.0
Medical research				
MRC	Genetic Approach to Human Health	4.1	12.6	16.0
MRC	Neurosciences	2.3	6.2	10.0
ESRC	Urban Health IRC	0.6	1.4	1.0
MRC	Diabetes	0.8	1.7	1.0
MRC	Imaging	2.2	4.4	5.0
MRC	Clinical Research consolidation	2.7	4.0	4.0
Sub-Total		12.7	30.3	40.0
Environmental research				
AFRC	Climate Change: Biological Response	2.0	4.1	6.0
ESRC	GEC: Populations and migration	0.3	0.7	0.0
NERC	Satellite Earth Observation	1.7	3.2	3.0
SERC	GEC: Earth Observation/Atmosphere	4.5	9.6	11.0
NERC	Land Ocean Interaction Study	6.4	9.5	11.0
AFRC	Cleaner Technologies	1.3	3.3	4.0
ESRC	Cleaner Technologies	0.3	0.7	0.0
SERC	Cleaner Technologies	2.2	4.5	6.0
Sub-Total		18.7	35.6	45.0
Other scientific opportunities				
SERC	Materials Programmes	12.4	22.6	26.0
AFRC	Intracellular Signalling	2.2	3.5	4.0
AFRC	Image Analysis in Biology	1.3	2.4	3.0
NERC	British Mid-Ocean Ridge Initiative	6.0	4.8	5.0
ESRC	Managing Change in Public Services	0.2	0.8	0.0
ESRC	European Science Policy	0.2	0.5	0.0
Sub-total		22.3	34.6	40.0
TOTAL PES BID 1991		93.1	164.0	195.0

TOTAL PES BUD 1991

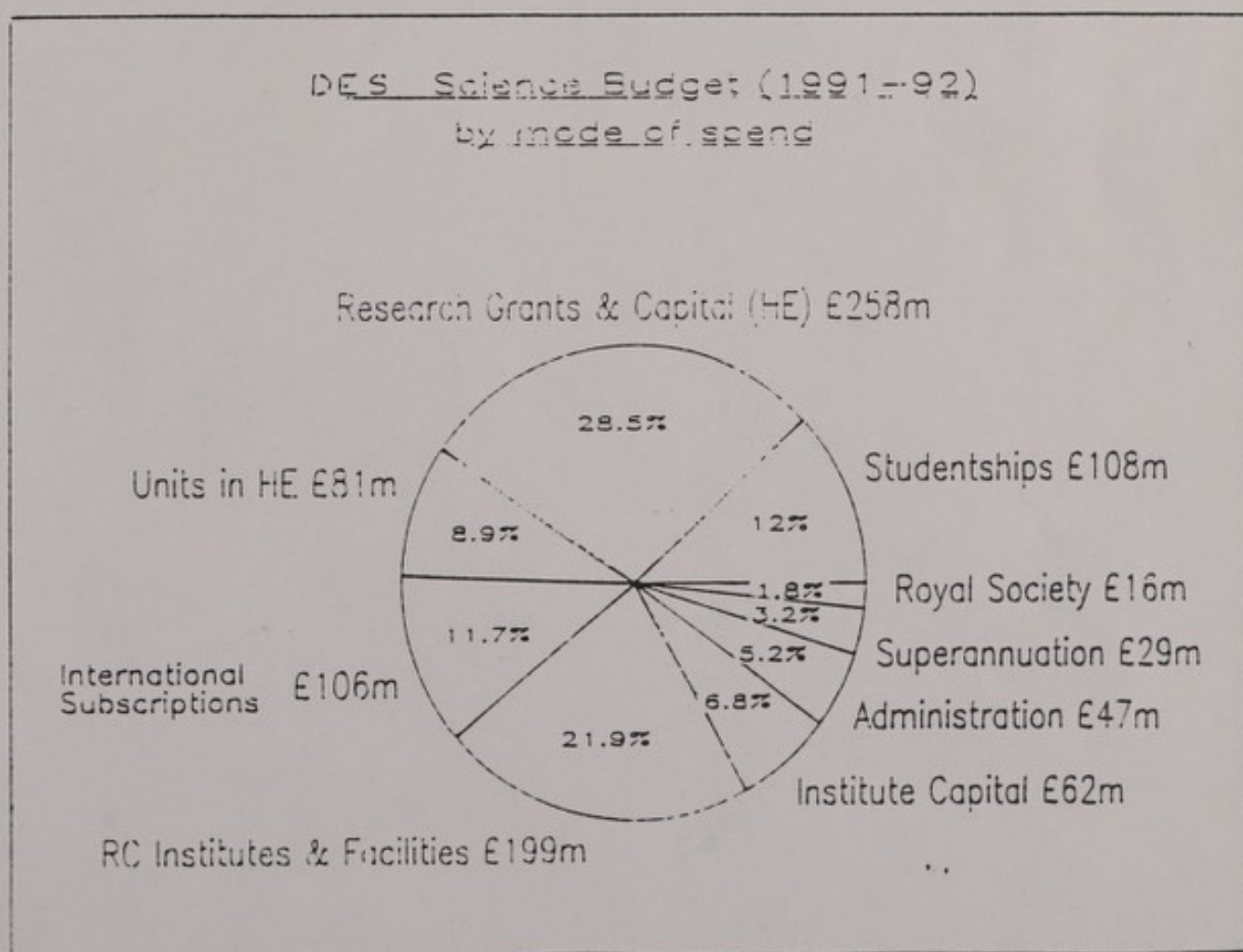
TOTAL PES BUD 1991		1992-93	1993-94
Sub-total		22.3	24.6
ESRC	European Science Policy	0.2	0.2
ESRC	Managing Change in Public Services	0.2	0.2
NERC	British Mid-Ocean Ridge Initiative	0.2	0.2
AFRC	Image Analysis in Biology	1.3	1.3
AFRC	Intracellular Signalling	2.2	2.2
NERC	Materials Programmes	12.4	12.4
Other scientific opportunities		16.7	16.6
Sub-Total		16.7	16.6
NERC	Cleaner Technologies	2.2	2.2
ESRC	Cleaner Technologies	0.2	0.2
AFRC	Cleaner Technologies	0.2	0.2
NERC	Land Ocean Interaction Study	1.3	1.3
NERC	GEC: Earth Observation/Atmosphere	0.4	0.4
NERC	GEC: Satellite Earth Observation	1.2	1.2
ESRC	GEC: Populations and Migration	0.2	0.2
AFRC	Climate Change: Biological Response	2.0	2.0
Environmental research		12.7	10.3
Sub-Total		12.7	10.3
MRC	Clinical Research co-ordination	2.7	4.0
MRC	Imaging	2.2	4.4
MRC	Diabetes	0.2	1.7
ESRC	Urban Health IRC	0.2	1.7
MRC	Neurosciences	2.3	4.2
MRC	Genetic Approach to Human Health	2.1	12.6
Medical research		20.4	63.2
Sub-Total		20.4	63.2
AFRC	Supercomputing enhancements	2.0	2.0
AFRC	Institute equipment & capital	2.0	2.0
NERC	Advanced Fellowships	0.2	0.2
ESRC	Teaching Company Scheme	0.4	0.4
ESRC	Postgraduate Studentships	0.2	1.2
Royal Society	Small Grants schemes	0.2	0.2
AFRC	HEI grants and research groups	2.0	4.2
NERC	Engineering Board grants	17.0	17.0
NERC	Science Board grants	20.0	24.0
Core activities		59.4	89.2

PROPOSALS FOR ADDITIONAL FUNDING

PRESENT SCIENCE BUDGET ALLOCATIONS

	£ million			
	1991-92	1992-93	1993-94	1994-95
AFRC	92.5	89.9	90.9	91.2
ESRC	35.5	37.2	37.7	37.8
MRC	200.4	206.3	208.8	209.5
NERC	122.6	120.0	121.3	121.7
SERC	451.7	463.0	469.2	470.7
Royal Society	15.74	15.77	15.97	16.02
Fellowship of Engineering	1.39	1.45	1.46	1.47
ABRC (incl. CEST)	0.4	0.5	0.5	0.5
Flexibility Margin	0.0	38.7	60.1	82.3
Dual Support Transfer	0.0	50.0	100.0	102.5
TOTAL	920.3	1022.8	1106.0	1133.6

PLANNED DISTRIBUTION OF SCIENCE BUDGET 1991-92



PRESENT SCIENCE BUDGET ALLOCATIONS

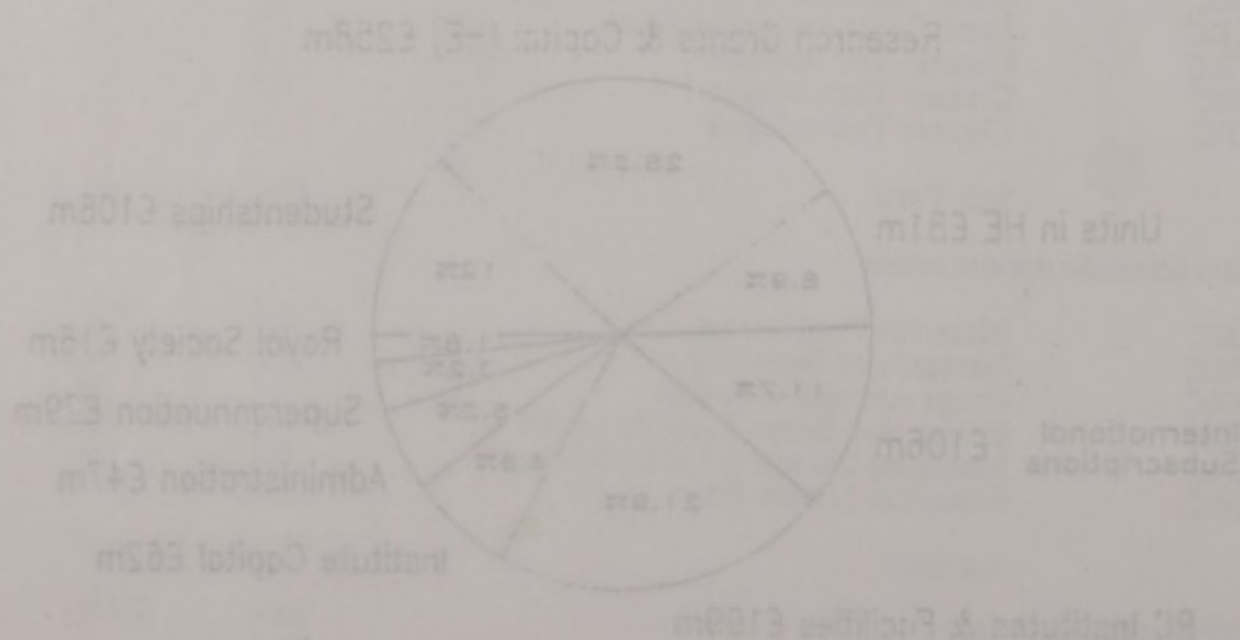
£ million

1991-92 1992-93 1993-94 1994-95

AFRC	95.2	89.9	90.9	91.2
ESRC	35.2	37.2	37.7	37.8
MRC	200.4	206.2	208.8	209.2
NERC	122.8	120.0	121.2	121.7
SERC	421.7	483.0	489.2	478.7
Royal Society	12.74	12.77	12.97	18.02
Fellowship of Engineering	1.39	1.48	1.48	1.47
ABRC (incl. CEST)	0.4	0.2	0.2	0.2
Flexibility Margin	0.0	28.7	60.1	87.3
Dual Support Transfer	0.0	20.0	100.0	102.2
TOTAL	920.3	1022.8	1106.0	1133.8

PLANNED DISTRIBUTION OF SCIENCE BUDGET 1991-92

Per Science Budget: (£281-92)
by mode of award



ABRC INFLATION ASSUMPTIONS

	<u>Pay</u>	<u>Non-Pay</u>
1990-91	100	100
1991-92	108	107
1992-93	115.3	113.2
1993-94	121.6	118.2
1994-95	127.7	123.0

ABRC INFLATION ASSUMPTIONS

Year	Rate
1990-91	100
1991-92	108
1992-93	112.3
1993-94	116.6
1994-95	121.7