

PART 5

CONFIDENTIAL FILING

Maintaining the strength of the
Science Base

The Science Budget

SCIENCE AND
TECHNOLOGY

PT 1: SEPTEMBER 1983

PTS: OCTOBER 1986

Referred to	Date	Referred to	Date	Referred to	Date	Referred to	Date
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25.11.86							
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PART 5 ends:-

J. FAIRCLOUGH TO DOE 13.8.V7

PART 6 begins:-

RTA TO J. FAIRCLOUGH 7.9.V7



CABINET OFFICE

70 Whitehall London SW1A 2AS Telephone 01-233 270 0259

CONFIDENTIAL

From John W Fairclough F Eng
Chief Scientific Adviser

W0127

D J Fisk Esq
Dept of the Environment
Romney House
43 Marsham Street
London SW1

13 August 1987

Dear David,

S & T PRIORITIES

WILL REQUEST IF REQUIRED

Thank you for your letter of 6 August concerning my paper for E(ST).

Generally I would expect that my papers to E(ST) will be brought forward through E(ST)(O). However where these are written in my role as Chief Scientific Adviser rather than as Chairman of E(ST)(O) this will not invariably be the case, particularly where there are problems over the timing of the official and ministerial meetings.

You raised two important matters of substance which, as David Norgrove's minute indicates, are expected to be discussed by E(ST) in September. I believe the selection of technologies by my proposed criteria will increase the contribution of Government spending to the efficiency, competitiveness and innovative capacity of the UK economy. Different criteria will be appropriate for assessing other S & T expenditure such as on science and for procurement and supporting policy (as indicated in my paper). On the question of Departmental responsibility for advising on priorities, DES have moved a considerable way towards this for science through the development of the ABRC Strategy Advice. As DTI undertake their review of innovation policy this will be in the context of the whole range of technologies and should naturally lead to advice from DTI across these technologies.

I am copying this letter to members of E(ST)(O).

Yours sincerely,

JOHN W FAIRCLOUGH

CBG



MINISTRY OF DEFENCE
 MAIN BUILDING WHITEHALL LONDON SW1
 Telephone 01-~~836782~~ 218 2111/3

MO 26/2L

30th July 1987

n bpm at the stage

Dear Mr Fairclough,

PRIORITIES FOR SCIENCE AND TECHNOLOGY

The Defence Secretary has seen David Norgrove's letter of 27th July and has asked me to register a number of points in advance of the formal consideration of your proposals by E(ST) in September.

In discussing the Government's role in funding science and technology, the paper (E(ST)(87)6) rightly draws a distinction (paragraphs 5 and 6) between the issues which arise on the one hand for Departments with responsibilities for procurement, standards and regulations and, on the other, for those with direct responsibilities for supporting science and industry. This distinction is not, however, reflected in the criteria (proposed in paragraph 8) for the selection of technologies for Government support, which are confined to economic objectives. Important though these are, the primary functions and responsibilities of individual Departments must also be fully reflected in the selection process. In the case of the MOD, we regard it as essential to evaluate and where necessary support, notably through funded development programmes, those areas of science and technology which contribute to the provision of weapons and equipment for the Armed Forces which are effective against the perceived threat. The technologies concerned would desirably also be those which serve wider economic or industrial objectives but not necessarily so, given the highly specialised nature of many military requirements.

For the same reasons, we do not think it appropriate for the Department of Trade and Industry to be the sole adviser on technologies which the Government should support or where responsibility for action should lie. Advice from the DTI on which technologies are deemed to contribute most to the improvement of the United Kingdom's economic performance would indeed be welcome and we have no objection to the DTI taking the lead in co-ordinating Departments' recommendations on technology

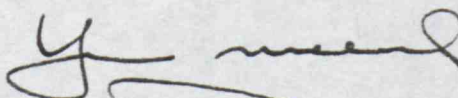
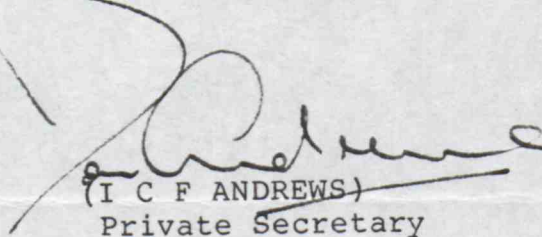
J W Fairclough Esq
 Chief Scientific Adviser
 Cabinet Office



priorities. But DTI has little, if any, basis for judging what is important for defence purposes and there must therefore be a dialogue reflecting the individual responsibilities and functions of Departments.

Our second point concerns your proposals on financial headroom. As you are aware, we have already reviewed our formal commitment to our R&D programme against the financial ceilings for R&D imposed by E(A) and will continue to do so. While my Secretary of State would have no objection to giving the information you have requested for the PES period - and arrangements have been made to do this - he would be unwilling to accept the implication in paragraph 14(vi) of your paper that part of the expenditure for which he is responsible should be separated from the Defence Budget and be subject to some form of central management and disposal. He feels strongly that, with defence R&D already constrained, its management within the financial limits that have been set must remain his responsibility and be judged against the imperatives of defence requirements, subject, of course, to the improved inter-Departmental consultative arrangements which have recently been introduced.

I am sending copies of this letter to David Norgrove and to the Private Secretaries of the other members of E(ST).



(I C F ANDREWS)
Private Secretary

Sci + Tech

Budget

PT 5





Alie

bc BG

10 DOWNING STREET

LONDON SW1A 2AA

From the Private Secretary

MR. FAIRCLOUGH

CABINET OFFICE

PRIORITIES FOR SCIENCE AND TECHNOLOGY

The Prime Minister was grateful for the note on priorities for science and technology circulated as E(ST)(87)6. She has noted your intention to circulate a substantive paper in the autumn and would wish to hold a meeting to discuss this before the end of September if possible. She has asked that Departments should identify forward commitments in their science and technology budgets and send them to you to help to establish the headroom for change (recommendation (vi) in the paper), but would prefer to consider the other recommendations at the September meeting.

The Prime Minister thought you and other members of E(ST) might be interested to see the note enclosed which has been prepared by Mr. George Guise of the No. 10 Policy Unit.

I am copying this minute to the Private Secretaries to the members of E(ST), Mike Eland (Lord President's Office) and to Trevor Woolley (Cabinet Office).

DWS

David Norgrove

27 July 1987

ECW

PUBLIC EXPENDITURE ON SCIENCE

When Gladstone asked Faraday whether electricity might ever have a useful purpose, he replied 'Yes, Sir. One day you will tax it'. By contrast, Rutherford claimed in the 1930s that 'anyone who expects a source of power from the transformation of atoms is talking moonshine'. The prescience of Faraday is rare. Most people working in fundamental science, as well as those who fund them, have no idea what economic benefit the work will bring.

Economic incentives will spur the solution of specific scientific problems which are clearly defined in fundamental terms. For example, the physical principles involved in putting men on the moon were well understood before the American space programme began and the release of funds caused it to happen. By contrast, our knowledge of the biological principles underlying cell mutation is still very limited. Hence the failure of Nixon's proposed attack on cancer which was modelled explicitly on the success of the space programme and derived from the mistaken belief that American scientific ingenuity could solve any problem given enough funding. A general cure for cancer will almost certainly come from advance in fundamental biological theory. Indeed, it is not unreasonable to posit that the next two centuries will see biological development transform medicine in the same way that the advance in physical science over the past 200 years has transformed technology.

There exists in Government and industry a general mood which stresses the economic rather than the intellectual value of science and hence that resources should be shifted from pure science to technology. This attitude underlies the recent ABRC proposals and is common at the DTI, who sometimes confuse value for money with return on capital. It is

actually a form of national short-termism and reeks of state intervention in industry. This philosophy misunderstands both the contribution of science to economic progress and the proper role of the public sector in stimulating it.

Examples of the Economic Consequences of Basic Science:

The greatest economic benefits of scientific research have always resulted from advances in fundamental knowledge rather than the search for answers to specific applied problems:

- 1 Transistors were not discovered by the entertainments industry seeking new ways of marketing pop groups but by people working on wave mechanics and solid state physics.
- 2 The binary logic circuits of computers were not found by accountants seeking to store and rapidly process information but by physicists in the 30s wishing to count elementary particles.
- 3 Nuclear energy was not discovered by oil companies with large budgets seeking alternative forms of energy but by scientists like Einstein, Rutherford and Bohr.
- 4 The true founders of the electronic industry were people like Thompson and Lorenz in the 19th century, not businesses seeking to market new consumer products.
- 5 Induction coils in motor cars were made possible by the work of Faraday, not the transport industry.
- 6 Electric-magnetic waves for our televisions and cellular telephones are the direct legacy of Maxwell and Hertz, not applied research targetted on better communication.

Development is frequently the other way round. The speed with which radar could be utilised after its fundamental discovery was due to the pre-existence of cathode ray tube technology developed extensively by the pre-war television industry.

All the above examples above have a common feature. Each describes a basic scientific discovery whose application has proved, in the narrowest of economic terms, hugely profitable. A modern economy owes at least 5% of national income to the utilisation of electricity. Assuming a rate of interest equal to the rate of growth, this implies that the benefit to the British economy of accelerating the commercial exploitation of electricity by one year is around 5% of annual national income - or £20 billion at current prices. The economic benefits of that alone would greatly exceed the cost of all fundamental scientific research undertaken in the UK since the time of Newton! Again, energy production - principally from coal and North Sea oil - absorbs just under 10% of national income. So the discovery of a source of cheap energy which reduced these costs by half would, at a real interest rate of 3%, have a present value of around £600 billion.

Six Fallacies:

Scientific inquiry, without economic direction, over the past centuries has formed the bedrock of a modern economy. It is, paradoxically, economists, produced by such a society, who now increasingly promote the view that public sector funds should be directed towards specifically applicable research projects. I believe that is precisely the reverse of the policy required. In order to demonstrated this, we need to examine a number of fallacies:

1. Public contribution to industrial research increases the amount spent by industry.

44% of civil R&D is funded by British private industry compared with 53% in the USA, 80% in Japan, 59% in Germany and 46% in France. Measured as a percentage of GDP our private sector also generally spends less than comparable other countries. (Appendix 1)

The trend is, however, upwards:

- (a) The latest survey of industrial R&D shows that industry financed some 66% of the industrial spend in 1985 compared with 63% in 1983.
- (b) As the British manufacturing base regenerates, the industrial inclination to spend on R&D should rise to levels comparable with competitor countries.

It is certainly in industry's own interest to remain competitive and those industries that do not will go to the wall. It is the recovery of the economy which will reactivate industrial R & D not investment by the State. Government does have a positive function in coordinating research efforts, assisting with reducing Brussels type bureaucracy, and disseminating information. It should not, however, be investing taxpayers' money in the research itself.

Nowhere have I seen a proper analysis of whether programmes like Alvey have been effective in terms of causing research to happen which otherwise would not. Indeed, much of the Support for Innovation (SFI) budget is going to profitable companies that should finance their own R&D. It is therefore arguable that Britain's private sector spend on research would actually increase

if programmes like Alvey, Eureka, and Link confined Government's role to coordination rather than investment of taxpayers' money.

This is quite consistent with our long term goal of minimising State intervention. The current practice of the DTI is actually part of the old system of strong central direction of industrial effort. Indeed, the DTI is very confused about its research role. It continues to confuse return on capital with value for money and tends to pay for work which would be carried out by companies anyway. On matters like launch aid, it does not push industry hard enough as was recently demonstrated over Airbus.

2. Basic research is a luxury because it produces no profit

The argument here is that the support of intellectual rather than pre-defined economic targets is rather like funding the Arts Council. It may improve the world for an elite but has no measurable economic benefit. Even the protagonists get trapped by the confusion between return on capital and value for money.

Financial return measurements should only be used to choose among different possible investments where the outcome is capable of pre-definition and therefore financial estimation. This measurement belongs more in the domain of business than Government, especially when considering research funding. We should recognise that basic research is organically part of the national interest and that the route to success is to back individuals and teams, not remote goals which pre-judge the outcome of the work.

3. Without financial return criteria funds will be

frittered and used incompetently.

A research budget can be well administered with a high percentage of spend going into the field. The key factor is the quality and motivation of those individuals who are actually allowed to spend money.

When Einstein went to Princetown, Rockefeller put funds of half a million dollars into a bank account and told him to draw on it whenever he chose. Einstein promptly forgot the money was even there because his work did not require it. Abdus Salam tells me that his Institute in Trieste has only three people involved in administration who report to him regularly on what is being spent and why.

In contrast, CERN has a very high proportion of non-productive staff and an administrative structure which was set up in the 1950s. It is laudable that their work has been so dramatically successful, and their experiments so well implemented, but the overhead must be attacked. The Abragam Report is refreshingly self-critical on these issues and recommends a number of immediate staff reductions (see separate appendix on visit to CERN).

4. World resources should be pooled wherever possible.

One of the key motivators for a productive scientist is competition. James Watson was obsessed with finding the DNA structure before Linus Pauling for internal self achievement reasons as powerful as any other entrepreneur's. The principle of competing research teams, both domestically and internationally, should promote the achievement of excellence in research just as much as in merchant banking. The underlying motivation does not stem from hubris but the natural

desire of gifted people visibly to excel.

The big difference is that research teams are generally not cash self-sufficient and, particularly when addressing the enormous funding requirements of 'big science', some very brilliant heads will have to be banged together. For example, the CERN people tell me that if the Americans were prepared to join the LEP project, a hadron colliding ring could be built within the existing 27 kilometres tunnel for a fifth of the \$4.5 billion cost of the proposed 87 kilometre American superconducting supercollider (SSC). This would then cover the first half of the 40,000 GEV energy spectrum proposed for the American machine. It would also reduce the subscription of existing members if an entry premium were charged!

5. Fundamental science can always be done elsewhere with Britain enjoying the fruits.

In the short term this is a truism not a fallacy. If Britain were to abandon fundamental research altogether, the same work would be undertaken by the same people in other countries. The resultant brain drain would reduce public expenditure as would the reduced capital requirements. At present we have a relatively liberal international order in the flow of ideas and information. This extends not only to a free-flow of scientific papers but also to the free exchange of technical specifications accompanied by willingness to respect patents. If Britain reduced support for basic research, scientific papers and information would still cross the Atlantic.

In the longer term, however, this is a great fallacy because, ultimately, there would be nobody here who understood what was being discovered or be invited to

participate in the idea flow. Just as defence is a public good in which any self-respecting nation should seek to be self-sufficient so is the generation of scientific knowledge. The argument that we can leave everything to the United States is as fallacious on research as it is on defence.

Consider also the association between fundamental and applied research. Given that today's basic research provides tomorrow's technology there has to be continuous dialogue between the workers in both fields. To cut one will terminate the dialogue. It is no coincidence that Silicon Valley and Route 126 are located respectively in California and Massachusetts which also contain the densest concentration of high quality fundamental research anywhere in the world. The businesses there were often founded by individuals who trained at proximate establishments pre-eminent in basic science. These businesses recruit from the same sources and continuously interact with them thereby generating a community of intellectual excitement as well as commercial success. A similar phenomenon is beginning here at Cambridge.

6 Selectivity will starve us of Specific Skills.

The foregoing does not argue that everything, however expensive, has to be done or invested in by the UK. Because of the huge costs of advances in hydrogen fusion, particle physics, the mapping the human genome, or space, it is essential to be selective.

The two guiding principles should be that what we do must be done well with adequate funding and that where Britain has achieved leadership it should continue that activity. We should also set a separate budget for 'big science', where annual funding per item exceeds say £10 million,

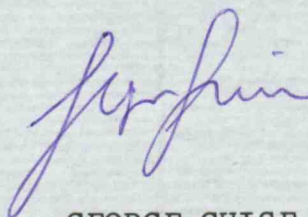
from the vast majority of smaller projects which constitute the remainder.

Recommendations

- 1 The investment of public funds in industrial research should be discouraged except where the State is the customer.
- 2 The proper role for Government in this sector is co-ordination, information dissemination and the reduction of bureaucratic impediment.
- 3 Basic research is essential to long term national prosperity and its funding is a primary function of Government.
- 4 Selectivity is essential and money should be directed at individuals and teams who have demonstrated excellence.
- 5 The tendency of the research councils to spread the jam too thinly over everything must be strongly resisted. It is a diluted form of socialism.
- 6 We should decide how much the nation can afford for basic science and allocate according to the quality of what is proposed.
- 7 A budget for "big-science" should be identified within the general total with a specific limit imposed.
- 8 Appropriate measures of efficiency must be defined for how money is spent on all major projects. These measures should be reported against whenever annual budgets are reset.
- 9 International projects should be encouraged provided

action is taken to ensure efficient administration.

- 10 Once a forward budget has been agreed in the appropriate currency, exchange rate fluctuations should be borne by the reserve not the project. (This problem has bedevilled CERN and obscured the more important issue of the efficiency of spending.)



GEORGE GUISE

Appendices

- 1 Preliminary figures for public and private R&D spending
- 2 Report on a recent visit to CERN

SCIENCE AND TECHNOLOGY EXPENDITURE

A1 International Comparisons

	<u>1985</u>				
	UK	US	Japan	Germany	France
Total expenditure on R & D as % of GDP	2.3	2.8	2.6	2.7	2.3
			a		
Government R & D funding as % of GDP	1.3	1.3	0.5	1.1	1.5
			b		
Government <u>civil</u> R & D as % of GDP	0.6	0.4	0.5	1.0	1.0
			b		
Industry's own funding as % of GDP	1.0	1.3	1.7	1.6	1.0
			a		

Changes 1981 to 1985

Total expenditure on R & D as % of GDP	-0.1	0.4	0.3	0.3	0.3
			a		
Government R & D funding as % of GDP	-0.1	0.2	--	--	--
			b		
Government <u>civil</u> R & D as % of GDP	-0.1	--	--	--	--
			b		
Industry's own funding as % of GDP	0.1	0.2	0.2	0.2	0.2
			a		

Relative size of GDP, 1985

GDP index	100	642	229	121	102
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a = 1984 or 1981-84, b = 1983 or 1981-1983, -- = no change

A2 Government Expenditure on R & D by Departments (1985/86 Constant Prices)

Department	Outturn		Estimated	£ millions		
	1984/85	1985/86	Outturn 1986/87	Plans 1987/88	1988/89	1989/90
Civil Departments						
MAFF	126.6	118.4	114.5	104.2	102.9	102.3
DES	24.1	24.8	23.2	23.0	22.0	22.1
DEn	37.9	32.3	182.4	166.1	165.0	166.2
UKAEA	207.9	189.6	-	-	-	-
DOE	40.5	45.7	60.1	58.9	54.3	54.7
ODA	21.9	24.9	29.0	30.9	31.5	32.2
DHSS	27.2	27.2	29.7	32.0	33.1	30.4
HSC	8.7	5.3	4.6	4.8	4.8	4.9
Home Office	14.0	13.7	13.5	15.3	15.2	15.0
DTI	367.5	374.4	355.7	346.7	351.7	378.3
DTp	34.7	25.0	23.5	24.9	24.3	24.0
N I Depts	12.2	13.8	14.9	15.1	15.9	16.5
Scottish Depts	56.5	53.8	54.0	52.2	52.2	52.5
Other Depts	27.2	34.5	39.0	38.9	39.8	39.6
TOTAL CIVIL DEPARTMENTS	1006.8	982.1	941.7	909.3	908.0	933.4
TOTAL RESEARCH COUNCILS	537.3	528.0	544.7	561.0	541.6	516.0
UGC etc	667.7	669.0	678.6	690.6	670.0	669.8
TOTAL CIVIL	2211.8	2179.1	2165.0	2160.9	2119.6	2119.1
TOTAL DEFENCE	2306.6	2340.9	2263.8	2265.6	2222.3	2113.9
TOTAL ALL GOVERNMENT(NET)	4518.5	4519.9	4428.9	4426.5	4341.8	4233.0

Expenditure on R & D by British private industry

£ million	At current prices					At 1981 prices				
	1975	1978	1981	1983	1985	1975	1978	1981	1983	1985
All product groups	1340.1	2324.3	3792.5	4163.3	5145.8	3065.7	3581.4	3792.5	3574.8	4004.7
All products of manufacturing industry	1275.4	2212.6	3511.7	3969.9	4697.3	2917.8	3409.5	3511.7	3322.9	3856.1
Chemical industries	227.4	394.1	617.4	735.0	941.9	540.1	625.5	617.4	635.9	739.2
Mechanical engineering (1)	103.4	181.1	276.0	260.3	269.2	230.8	254.0	276.0	220.2	206.5
Electronics (2)	279.0	649.6	1221.2	1463.2	1738.0	629.7	997.9	1221.2	1255.0	1352.5
Other electrical engineering	73.0	100.8	120.8	117.7	136.5	165.1	154.9	120.9	101.2	106.7
Aerospace	291.5	424.6	762.9	720.0	845.3	661.1	646.3	762.9	616.9	656.7
Motor vehicles	88.3	129.7	180.4	239.5	371.6	198.5	197.2	190.4	204.7	257.8
Other manufactured products	212.8	332.6	333.1	334.3	394.9	492.5	523.9	333.1	288.2	308.5
Non-manufactured products	64.8	111.7	280.8	293.5	448.4	147.9	171.9	280.8	251.9	348.7

(1) Including office machinery

(2) Including electronic data processing equipment

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APPENDIX 2

NOTE ON A VISIT TO CERN

I spent a day at CERN at the end of May and had an hour with Herwig Schopper, the Director General, both at the beginning and end of the visit. I met key individuals in both the experimental and theory divisions and visited most of the experimental facilities. The Proton Synchrotron complex and the UAI detector were down for overhaul.

CERN's greatest achievement was the conversion of the 450 GEV Super Proton Synchrotron (SPS) to a Proton-antiproton collider. Because far more energy goes into the collision, when particles are moving in opposite directions, this allowed an energy level of 630 GEV to be obtained. This covered the spectrum where the W and Z particles were ultimately found and announced in early 1983.

In the afternoon I visited the theory division, with a strong showing of British scientists, who gave me their views on how the next phase of intellectual advance could happen. Contrary to lay opinion, the range of truly elementary particles has not been growing like topsy over the last few decades, but condensing into a much smaller number of highly abstruse objects such as quarks, of which there are believed to be six, and leptons, such as the electron and neutrino, of which there are also believed to be six.

Modern theories of how these objects are bound together into normal matter have made great progress by interpreting force as the exchange of a new kind of particle generically known as 'gauge bosons'. Indeed, it was the experimental work at CERN which demonstrated the existence of the W and the Z bosons which substantiated the revolutionary theory advanced by Abdus Salam and others in the 70's. It was suggested that the forces associated with electricity, magnetism and the

decay of neutrons (responsible for nuclear energy), are different facets of the same underlying unity. The next goal is to continue this unification to the strong nuclear force and ultimately to gravitation.

I also visited the LEP tunnel, which has been completely dug and concreted, and now awaits the installation of the electron-positron collider tubes and the accelerating and detecting equipment. This is the 27 kilometre tunnel which is wide enough to carry a hadron collider tube similar to that which the Americans propose for their 87 kilometre SSC. The purpose of the work at LEP is diverse, but it is particularly directed to identifying a new boson at energy levels above 100 GEV. If this were to happen, a fundamentally new theory, advanced by Higgs at Edinburgh and developed by Kibble of London, would be substantiated. The theory proposes a mechanism by which elementary particles, and therefore ultimately all material objects, acquire mass.

My overall impression is that the work will eventually rank alongside the pioneering of Faraday and Maxwell, but that it is pointless to hypothesize any economic purpose today. The scientific team, the success record and the whole approach impresses. By contrast, the administrative system was in great need of overhaul. Schopper and his colleagues are quite aware of this and are embarrassed that the administrative staff required to run the whole establishment has grown to 3000 people compared with some 300 productive scientists. Local unskilled workers are employed on similar contracts to highly skilled professional scientists seconded from abroad!

There is clearly much fat that needs to be thinned and the Abragam report is quite self critical making a number of immediate proposals for staff cutbacks and the recruiting of local labour on normal commercial terms. The CERN management is quite restricted in what it can change without the

agreement of its Council representing 14 different countries. When CERN was set up in the 1950's the individual countries appointed key individuals such as ministers to the Council. The administration became increasingly fossilized over the years with lower calibre representation on the Council. This has caused the management to grind on with antiquated procedures, particularly in financial allocation and accounting.

CERN is performing some of the most important work in the world, but it could be run better with greatly improved value for money.

PRIME MINISTER


SCIENCE

John Fairclough has circulated two papers which he hopes might be discussed at E(ST) on Thursday next week. Comments - which amount in some ways to an alternative approach - by George Guise are below.

These papers do not require discussion now. No immediate decisions are required, and the time really needs to be used for your meeting on the Social Fund. Indeed, if E(ST) is held, I cannot easily see how time can be found for that meeting.

I recommend that you agree the paper's recommendation, (vi), that all Departments should identify forward commitments in their science and technology budgets and let John Fairclough have details to establish the head-room for change, that you note the intention to circulate a more substantive paper Autumn and that you would intend to hold a meeting to discuss this in September.

Agree?

Yes 

It would stimulate thought also to circulate George Guise's note to E(ST). I suggest without the annexes.

Agree?

Yes - *at first without the annexes - but those should eventually go to selected people or be used as a basis for material designed to extract the same information.*

Vanessa

pp. D.R.N
24 July 1987

PMMADT

PUBLIC EXPENDITURE ON SCIENCE

When Gladstone asked Faraday whether electricity might ever have a useful purpose, he replied 'Yes, Sir. One day you will tax it'. By contrast, Rutherford claimed in the 1930s that 'anyone who expects a source of power from the transformation of atoms is talking moonshine'. The prescience of Faraday is rare. Most people working in fundamental science, as well as those who fund them, have no idea what economic benefit the work will bring.

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The greatest economic benefits of scientific research have always resulted from advances in fundamental knowledge rather than the search for answers to specific applied problems:

- 1 Transistors were not discovered by the entertainments industry seeking new ways of marketing pop groups but by people working on wave mechanics and solid state physics.
- 2 The binary logic circuits of computers were not found by accountants seeking to store and rapidly process information but by physicists in the 30s wishing to count elementary particles.
- 3 Nuclear energy was not discovered by oil companies with large budgets seeking alternative forms of energy but by scientists like Einstein, Rutherford and Bohr.
- 4 The true founders of the electronic industry were people like Thompson and Lorenz in the 19th century, not businesses seeking to market new consumer products.
- 5 Induction coils in motor cars were made possible by the work of Faraday, not the transport industry.
- 6 Electric-magnetic waves for our televisions and cellular telephones are the direct legacy of Maxwell and Hertz, not applied research targetted on better communication.

Development is frequently the other way round. The speed with which radar could be utilised after its fundamental discovery was due to the pre-existence of cathode ray tube technology developed extensively by the pre-war television industry.

All the above examples above have a common feature. Each describes a basic scientific discovery whose application has proved, in the narrowest of economic terms, hugely profitable. A modern economy owes at least 5% of national income to the utilisation of electricity. Assuming a rate of interest equal to the rate of growth, this implies that the benefit to the British economy of accelerating the commercial exploitation of electricity by one year is around 5% of annual national income - or £20 billion at current prices. The economic benefits of that alone would greatly exceed the cost of all fundamental scientific research undertaken in the UK since the time of Newton! Again, "energy production - principally from coal and North Sea oil - absorbs just under 10% of national income. So the discovery of a source of cheap energy which reduced these costs by half would, at a real interest rate of 3%, have a present value of around £600 billion.

Six Fallacies:

Scientific inquiry, without economic direction, over the past centuries has formed the bedrock of a modern economy. It is, paradoxically, economists, like Douglas Hague, that such a society has produced, who now increasingly promote the view that public sector funds should be directed towards specifically applicable research projects. I believe that is precisely the reverse of the policy required. In order to demonstrate this, we need to examine a number of fallacies:

1. Public contribution to industrial research increases the amount spent by industry.

44% of civil R&D is funded by British private industry compared with 53% in the USA, 80% in Japan, 59% in Germany and 46% in France. Measured as a percentage of GDP our private sector also generally spends less than comparable other countries. (Appendix 1)

The trend is, however, upwards:

(a) The latest survey of industrial R&D shows that industry financed some 66% of the industrial spend in 1985 compared with 63% in 1983.

(b) As the British manufacturing base regenerates, the industrial inclination to spend on R&D should rise to levels comparable with competitor countries.

It is certainly in industry's own interest to remain competitive and those industries that do not will go to the wall. It is the recovery of the economy which will reactivate industrial R & D not investment by the State. Government does have a positive function in coordinating research efforts, assisting with reducing Brussels type bureaucracy, and disseminating information. It should not, however, be investing taxpayers' money in the research itself.

Nowhere have I seen a proper analysis of whether programmes like Alvey have been effective in terms of causing research to happen which otherwise would not. Indeed, much of the Support for Innovation (SFI) budget is going to profitable companies that should finance their own R&D. It is therefore arguable that Britain's private sector spend on research would actually increase

if programmes like Alvey, Eureka, and Link confined Government's role to coordination rather than investment of taxpayers' money.

This is quite consistent with our long term goal of minimising State intervention. The current practice of the DTI is actually part of the old system of strong central direction of industrial effort. Indeed, the DTI is very confused about its research role. It continues to confuse return on capital with value for money and tends to pay for work which would be carried out by companies anyway. On matters like launch aid, it does not push industry hard enough as was recently demonstrated when we made them fight for an extra percent return on future Airbus superprofits.

2. Basic research is a luxury because it produces no profit

The argument here is that the support of intellectual rather than pre-defined economic targets is rather like funding the Arts Council. It may improve the world for an elite but has no measurable economic benefit. Even the protagonists get trapped by the confusion between return on capital and value for money.

Financial return measurements should only be used to choose among different possible investments where the outcome is capable of pre-definition and therefore financial estimation. This measurement belongs more in the domain of business than Government, especially when considering research funding. We should recognise that basic research is organically part of the national interest and that the route to success is to back individuals and teams, not remote goals which pre-judge the outcome of the work.

3. Without financial return criteria funds will be frittered and used incompetently.

A research budget can be well administered with a high percentage of spend going into the field. The key factor is the quality and motivation of those individuals who are actually allowed to spend money.

When Einstein went to Princetown, Rockefeller put funds of half a million dollars into a bank account and told him to draw on it whenever he chose. Einstein promptly forgot the money was even there because his work did not require it. Abdus Salam tells me that his Institute in Trieste has only three people involved in administration who report to him regularly on what is being spent and why.

In contrast, CERN has a very high proportion of non-productive staff and an administrative structure which was set up in the 1950s. It is laudable that their work has been so dramatically successful, and their experiments so well implemented, but the overhead must be attacked. The Abragam Report is refreshingly self-critical on these issues and recommends a number of immediate staff reductions (see separate appendix on visit to CERN).

4. World resources should be pooled wherever possible.

One of the key motivators for a productive scientist is competition. James Watson was obsessed with finding the DNA structure before Linus Pauling for internal self achievement reasons as powerful as any other entrepreneur's. The principle of competing research teams, both domestically and internationally, should promote the achievement of excellence in research just as much as in merchant banking. The underlying

motivation does not stem from hubris but the natural desire of gifted people visibly to excel.

The big difference is that research teams are generally not cash self-sufficient and, particularly when addressing the enormous funding requirements of 'big science', some very brilliant heads will have to be banged together. For example, the CERN people tell me that if the Americans were prepared to join the LEP project, a hadron colliding ring could be built within the existing 27 kilometres tunnel for a fifth of the \$4.5 billion cost of the proposed 87 kilometre American superconducting supercollider (SSC). This would then cover the first half of the 40,000 GEV energy spectrum proposed for the American machine. It would also reduce the subscription of existing members if an entry premium were charged!

5. Fundamental science can always be done elsewhere with Britain enjoying the fruits.

In the short term this is a truism not a fallacy. If Britain were to abandon fundamental research altogether, the same work would be undertaken by the same people in other countries. The resultant brain drain would reduce public expenditure as would the reduced capital requirements. At present we have a relatively liberal international order in the flow of ideas and information. This extends not only to a free-flow of scientific papers but also to the free exchange of technical specifications accompanied by willingness to respect patents. If Britain reduced support for basic research, scientific papers and information would still cross the Atlantic.

In the longer term, however, this is a great fallacy because, ultimately, there would be nobody here who

understood what was being discovered or be invited to participate in the idea flow. Just as defence is a public good in which any self-respecting nation should seek to be self-sufficient so is the generation of scientific knowledge. The argument that we can leave everything to the United States is as fallacious on research as it is on defence.

Consider also the association between fundamental and applied research. Given that today's basic research provides tomorrow's technology there has to be continuous dialogue between the workers in both fields. To cut one will terminate the dialogue. It is no coincidence that Silicon Valley and Route 126 are located respectively in California and Massachusetts which also contain the densest concentration of high quality fundamental research anywhere in the world. The businesses there were often founded by individuals who trained at proximate establishments pre-eminent in basic science. These businesses recruit from the same sources and continuously interact with them thereby generating a community of intellectual excitement as well as commercial success. A similar phenomenon is beginning here at Cambridge.

6 Selectivity will starve us of Specific Skills.

The foregoing does not argue that everything, however expensive, has to be done or invested in by the UK. Because of the huge costs of advances in hydrogen fusion, particle physics, the mapping the human genome, or space, it is essential to be selective.

The two guiding principles should be that what we do must be done well with adequate funding and that where Britain has achieved leadership it should continue that activity. We should also set a separate budget for 'big science',

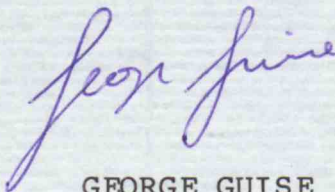
where annual funding per item exceeds say £10 million,
from the vast majority of smaller projects which
constitute the remainder. ||

Recommendations

- 1 The investment of public funds in industrial research should be discouraged except where the State is the customer.
- 2 The proper role for Government in this sector is co-ordination, information dissemination and the reduction of bureaucratic impediment.
- 3 Basic research is essential to long term national prosperity and its funding is a primary function of Government.
- 4 Selectivity is essential and money should be directed at individuals and teams who have demonstrated excellence.
- 5 The tendency of the research councils to spread the jam too thinly over everything must be strongly resisted. It is a diluted form of socialism.
- 6 We should decide how much the nation can afford for basic science and allocate according to the quality of what is proposed.
- 7 A budget for "big-science" should be identified within the general total with a specific limit imposed.
- 8 Appropriate measures of efficiency must be defined for how money is spent on all major projects. These measures should be reported against whenever annual budgets are reset.

- 9 International projects should be encouraged provided action is taken to ensure efficient administration.

- 10 Once a forward budget has been agreed in the appropriate currency, exchange rate fluctuations should be borne by the reserve not the project. (This problem has bedevilled CERN and obscured the more important issue of the efficiency of spending.)



GEORGE GUISE

Appendices

- 1 Preliminary figures for public and private R&D spending
- 2 Report on a recent visit to CERN
- 3 Some observations by Kumah Bhattacharya on SERC - the largest of the research councils.

SCIENCE AND TECHNOLOGY EXPENDITURE

International Comparisons

	<u>1985</u>				
	UK	US	Japan	Germany	France
Total expenditure on R & D as % of GDP	2.3	2.8	2.6	2.7	2.3
			a		
Government R & D funding as % of GDP	1.3	1.3	0.5	1.1	1.5
			b		
Government <u>civil</u> R & D as % of GDP	0.6	0.4	0.5	1.0	1.0
			a		
Industry's own funding as % of GDP	1.0	1.3	1.7	1.6	1.0

Changes 1981 to 1985

Total expenditure on R & D as % of GDP	-0.1	0.4	0.3	0.3	0.3
			a		
Government R & D funding as % of GDP	-0.1	0.2	--	--	--
			b		
Government <u>civil</u> R & D as % of GDP	-0.1	--	--	--	--
			b		
Industry's own funding as % of GDP	0.1	0.2	0.2	0.2	0.2
			a		

Relative size of GDP, 1985

GDP index	100	642	229	121	102
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a = 1984 or 1981-84, b = 1983 or 1981-1983, -- = no change

Government Expenditure on R & D by Departments (1985/86 Constant Prices)

Department	Outturn		Estimated	£ millions		
	1984/85	1985/86	Outturn 1986/87	Plans 1987/88	1988/89	1989/90
Civil Departments						
MAFF	126.6	118.4	114.5	104.2	102.9	102.3
DES	24.1	24.8	23.2	23.0	22.0	22.1
DEn	37.9	32.3	182.4	166.1	165.0	166.2
UKAEA	207.9	189.6	-	-	-	-
DOE	40.5	45.7	60.1	58.9	54.3	54.7
ODA	21.9	24.9	29.0	30.9	31.5	32.2
DHSS	27.2	27.2	29.7	32.0	33.1	30.4
HSC	8.7	5.3	4.6	4.8	4.8	4.9
Home Office	14.0	13.7	13.5	15.3	15.2	15.0
DTI	367.5	374.4	355.7	346.7	351.7	378.3
DTp	34.7	25.0	23.5	24.9	24.3	24.0
N I Depts	12.2	13.8	14.9	15.1	15.9	16.5
Scottish Depts	56.5	53.8	54.0	52.2	52.2	52.5
Other Depts	27.2	34.5	39.0	38.9	39.8	39.6
TOTAL CIVIL DEPARTMENTS	1006.8	982.1	941.7	909.3	908.0	933.4
TOTAL RESEARCH COUNCILS	537.3	528.0	544.7	561.0	541.6	516.0
UGC etc	667.7	669.0	678.6	690.6	670.0	669.8
TOTAL CIVIL	2211.8	2179.1	2165.0	2160.9	2119.6	2119.1
TOTAL DEFENCE	2306.6	2340.9	2263.8	2265.6	2222.3	2113.9
TOTAL ALL GOVERNMENT(NET)	4518.5	4519.9	4428.9	4426.5	4341.8	4233.0

Expenditure on R & D by British private industry

£ million	At current prices					At 1981 prices				
	1975	1978	1981	1983	1985	1975	1978	1981	1983	1985
All product groups	1340.1	2324.3	3792.5	4163.3	5145.8	3065.7	3581.4	3792.5	3574.8	4004.7
All products of manufacturing industry	1275.4	2212.6	3511.7	3869.9	4697.3	2917.8	3409.5	3511.7	3322.9	3859.0
Chemical industries	227.4	394.1	617.4	735.0	941.9	540.1	625.5	617.4	635.8	739.2
Mechanical engineering (1)	103.4	181.1	276.0	260.3	269.2	230.8	264.0	276.0	220.2	206.5
Electronics (2)	279.0	649.6	1221.2	1463.2	1739.0	629.7	997.9	1221.2	1256.0	1332.3
Other electrical engineering	73.0	100.8	120.8	117.7	136.5	165.1	154.9	120.8	101.2	106.7
Aerospace	291.5	424.6	762.9	720.0	845.3	661.1	646.3	762.9	616.9	656.7
Motor vehicles	88.3	129.7	180.4	239.5	371.6	198.5	197.2	190.4	204.7	297.8
Other manufactured products	212.8	332.6	333.1	334.3	394.9	492.5	523.9	333.1	288.2	308.5
Non-manufactured products	64.8	111.7	280.8	293.5	448.4	147.9	171.9	280.8	251.9	348.7

(1) Including office machinery

(2) Including electronic data processing equipment

15.S. IF8521

NOTE ON A VISIT TO CERN

I spent a day at CERN at the end of May and had an hour with Herwig Schopper, the Director General, both at the beginning and end of the visit. I met key individuals in both the experimental and theory divisions and visited most of the experimental facilities. The Proton Synchrotron complex and the UA1 detector were down for overhaul.

CERN's greatest achievement was the conversion of the 450 GEV Super Proton Synchrotron (SPS) to a Proton-antiproton collider. Because far more energy goes into the collision, when particles are moving in opposite directions, this allowed an energy level of 630 GEV to be obtained. This covered the spectrum where the W and Z particles were ultimately found and announced in early 1983.

In the afternoon I visited the theory division, with a strong showing of British scientists, who gave me their views on how the next phase of intellectual advance could happen. Contrary to lay opinion, the range of truly elementary particles has not been growing like topsy over the last few decades, but condensing into a much smaller number of highly abstruse objects such as quarks, of which there are believed to be six, and leptons, such as the electron and neutrino, of which there are also believed to be six.

Modern theories of how these objects are bound together into normal matter have made great progress by interpreting force as the exchange of a new kind of particle generically known as 'gauge bosons'. Indeed, it was the experimental work at CERN which demonstrated the existence of the W and the Z bosons which substantiated the revolutionary theory advanced by Abdus Salam and others in the 70's. It was suggested that the forces associated with electricity, magnetism and the

decay of neutrons (responsible for nuclear energy), are different facets of the same underlying unity. The next goal is to continue this unification to the strong nuclear force and ultimately to gravitation.

I also visited the LEP tunnel, which has been completely dug and concreted, and now awaits the installation of the electron-positron collider tubes and the accelerating and detecting equipment. This is the 27 kilometre tunnel which is wide enough to carry a hadron collider tube similar to that which the Americans propose for their 87 kilometre SSC. The purpose of the work at LEP is diverse, but it is particularly directed to identifying a new boson at energy levels above 100 GEV. If this were to happen, a fundamentally new theory, advanced by Higgs at Edinburgh and developed by Kibble of London, would be substantiated. The theory proposes a mechanism by which elementary particles, and therefore ultimately all material objects, acquire mass.

My overall impression is that the work will eventually rank alongside the pioneering of Faraday and Maxwell, but that it is pointless to hypothesize any economic purpose today. The scientific team, the success record and the whole approach impresses. By contrast, the administrative system was in great need of overhaul. Schopper and his colleagues are quite aware of this and are embarrassed that the administrative staff required to run the whole establishment has grown to 3000 people compared with some 300 productive scientists. Local unskilled workers are employed on similar contracts to highly skilled professional scientists seconded from abroad!

There is clearly much fat that needs to be thinned and the Abragam report is quite self critical making a number of immediate proposals for staff cutbacks and the recruiting of local labour on normal commercial terms. The CERN management is quite restricted in what it can change without the

agreement of its Council representing 14 different countries. When CERN was set up in the 1950's the individual countries appointed key individuals such as ministers to the Council. The administration became increasingly fossilized over the years with lower calibre representation on the Council. This has caused the management to grind on with antiquated procedures, particularly in financial allocation and accounting.

CERN is performing some of the most important work in the world, but it could be run better with greatly improved value for money.

SCIENCE & ENGINEERING RESEARCH COUNCIL

1. However selective the Government is in allocating funds to areas of research and development, the detailed distribution to universities will continue to involve SERC. There are two problems:
 - SERC has no track record of monitoring the achievements of the work it funds;
 - SERC has avoided setting performance measures and being held accountable to them.
2. These problems should be tackled before SERC is given a more important role in allocating resources.

Monitoring and Accountability

3. SERC funds both pure and applied research. Applied research must have return on investment measured, even if over a long timescale. Value for money on pure research can be obtained through professional management.
4. Monitoring of achievement is superficial, consisting of brief 'qualitative reviews by the Great and the Good. In allocating funds, SERC puts too much reliance on good intentions rather than track record.
5. For example, large amounts of public money have gone into robotics with very little benefit to the UK economy apart from isolated cases. The same university groups are still receiving large grants.
6. Even when SERC seeks industrial advice it is dominated by the individuals made available by the big companies; the "tired but tried used executives" who are generally not front-rank individuals.
7. Industrial contributions to collaborative R & D is too often in the form of a "soft" contribution such as management time rather than hard cash.
8. Value for money requires hard choices to be made. But peer review, as currently operated, runs with Committees of disgruntled academics who

prefer equitable distribution to picking winners (which means "you scratch my back and I'll scratch yours").

9. SERC as an organisation is in a trough. It is 22 years old and without any major restructuring during that time. Its staff are civil servants (fringe body) that blame all problems on too small a budget from Government. They have no experience of taking commercial judgements about R & D. In many cases they see themselves as a lobby against Government policy.

Training

10. SERC spends 18% of its budget directly on supporting the training of 9,000 postgraduate students. Its research grants also employ thousands of postdoctoral fellows. However, this important feedstock of talented individuals is being corrupted if they are trained in woolly, uncommercial and badly managed research methods.

In Short

- There should be a complete review of SERC's role and charter, and its relationship to other Government-funded R & D. In applied research its programmes overlap with those of the DTI.
- Its funding should be against clear performance objectives and on a customer-contractor basis. Part of the funding should be earmarked for professional programme management. Return on investment must be measured for applied research.
- Postgraduate training must be more disciplined. It must prepare individuals to make a contribution to the economy as well as to the academic world.
- Peer review by multitudinous specialist Committees (65 separate Committees in 1986 involving 800 individuals, most of them being paid fees) must be rationalised to bring real decision-making and accountability into the system. Officials must not be allowed to hide behind the Committees.

Science & Technology: Science Budget

PTS

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cc BG

10 DOWNING STREET
LONDON SW1A 2AA

16 July 1987

From the Private Secretary

Dear Rt,

PUBLICATION OF THE ABRC STRATEGY ADVICE

The Prime Minister has seen the draft statement attached to your letter to Mark Addison of 14 July, which would accompany publication of the ABRC document. The Prime Minister is content with the statement, subject to the views of colleagues, save that she would prefer the first sentence of the second paragraph to be amended along the lines:

".....the Government's policy is to maintain the strength and quality of the science base."

I am copying this letter to the Private Secretaries to members of E(ST), to John Fairclough and to Trevor Woolley.

Yours,
David

D. R. Norgrove

R. L. Smith, Esq.,
Department of Education and Science.

CONFIDENTIAL

lm

cc/g



ELIZABETH HOUSE
YORK ROAD
LONDON SE1 7PH
01-934 9000

Prime Minister
Content with the
statement, subject to
changes?

Mark Addison Esq
Private Secretary
10 Downing Street
LONDON SW1

14 July 1987

DLR
15/7.

See summary

Dear Mark,

PUBLICATION OF THE ABRC STRATEGY ADVICE

At its first meeting, on 1 July, E(ST) agreed that my Secretary of State should arrange publication before the recess of the strategy advice prepared by the Advisory Board for the Research Councils, and that he should issue a low key statement about it. Mr Baker undertook to circulate the text for this statement.

attached

It has since been arranged that the ABRC's document will be published on Monday 20 July - linked with the publication of the Government's response to the House of Lords report on Civil R & D and the Prime Minister's statement on that.

attached

I enclose the draft of the Answer which Mr Baker proposes to give about the ABRC advice. If the Prime Minister has any comments, please could you let me know by close of play on Friday 17 July.

I am copying this letter, with a similar invitation to comment, to the Private Secretaries of other members of E(ST), to John Fairclough and to Trevor Woolley.

yours sincerely,
Robert Smith

R L SMITH
Private Secretary

DRAFT STATEMENT ON ABRC STRATEGY ADVICE

MONDAY 20 JULY 1987

To ask the Secretary of State whether he will publish the Advisory Board for the Research Councils' strategic advice on the science base; and if he will make a statement.

MR KENNETH BAKER

The Advisory Board for the Research Councils' discussion document, "A Strategy for the Science Base", is being published today. It is an important contribution to the development of policy in this area, and I am grateful to Sir David Phillips and the members of the Board for their valuable advice.

? As announced in Cmnd 9849 last year, the Government's policy is to maintain and enhance the strength and quality of the science base. We seek to increase the returns to the nation from the public investment in scientific research, through greater concentration and selectivity, better targeting, closer links with industry, and more purposive management of research effort in the Research Councils and higher education. Many of the ABRC's recommendations are designed to meet these objectives.

Copies of the discussion document are being distributed widely to the higher education and scientific communities and other interested bodies. I am inviting their views and comments on the Board's recommendations by 31 October. In the light of these consultations the Government will announce its own conclusions on future policies for the science base and how these will be given effect.

CCB/KUP

PRIME MINISTER

30 June 1987

FIRST MEETING OF E(ST)

Although some of the specific powers which we originally sought for E(ST) have not been formally given, the proposed structure can be made very formidable. We now have an effective monitoring machine to keep tabs on how the scientists are spending Government funds across a matrix identifying both the kind of science being done as well as whether it is basic or applied. It is indeed remarkable that the individual Departments have had their heads banged together into agreeing the new E(ST).

It is important at this first meeting not to be acrimonious about individual programmes such as whether the breeder reactor is going to continue to absorb £100m per annum or whether defence R&D is properly defined. The important thing is that, when specific recommendations come, we now have a mechanism for addressing these questions at a committee which you will chair.

At this first meeting it is important that DES commit to an early White Paper setting out the ABRC framework for basic research in the universities, while DTI commit to a consultative document on applied science. In this way the two Government Departments which lead on basic and applied research will naturally become respectively the DES and the DTI.

The third and vital ingredient is the new ACOST whose individual membership is crucial. Indeed, it must become a national honour to be asked to serve on ACOST because once the mechanism is working ACOST will effectively address the whole spectrum of science and technology. In this way your ultimate objective of having the funds allocated by the

scientists themselves will happen.

Until that occurs, and it will take several years, the present system whereby Treasury retains the ultimate responsibility for cash release in the PES, with E(ST) effectively allocating it under advice from ACOST, will take yourself and your key Ministers into the heart of the allocating process. Furthermore, it will no longer be possible for a Department simply to switch funds from R&D to operations or indeed to different categories within R&D, unless it has specific agreement from E(ST). In this way the warring barons in the Research Councils will be able to make their pitch at the outset when funds are allocated but will thereafter need to justify every proposed change.

Specific Recommendations on the Meeting Papers

- 4
1. The terms for ACOST. These seem fine although the proposed membership of 20 individuals is certainly at the upper end of what can be an effective grouping. Later on you might test John Fairclough on whether he does need to have quite so many. The retention of Francis Tombs as Chairman is widely supported.
 2. The Government response to the House of Lords. This response addresses most of the concerns which their Lordships identified. In particular, Paragraph 7 identifies you personally with the setting of priorities. Indeed, one might insert the word 'direct' before leadership in the third line. In earlier drafts, I was concerned that we would lose the impact of this because of the fear of public identification of Cabinet committees.
 3. The ABRC strategy for the science base. Kenneth Baker clearly expects a big row about the proposal for categorising universities and recommends that we let it

run its course. Elsewhere the report is less controversial arguing that Government funding should concentrate on the more potentially exploitable activities. This is a basic philosophical issue to which we must return. It could be argued that a truly Thatcherite economy should leave all commercially exploitable research to industry. Public investment would be reserved for the most basic long-term scientific work as the citizens of Pisa funded Galileo.

Again, this is the kind of issue that can be properly debated with the proposed structure. For the present, we should publish the ABRC paper soon in order that public debate can be generated while the Government prepares its response.

4. The tax treatment of R&D expenditure. The Treasury finds no compelling evidence for increased tax relief for R&D in the UK. Indeed, those countries which do give more than normal tax allowance for R&D (Canada and Australia) have a surprisingly poor R&D industrial spend. The Treasury's conclusions should therefore be tested by publishing the report as proposed and seeing how well argued are the counter-arguments from the private sector.

I attach a copy of my earlier minute to you of March when we looked at Fairlough's initial proposals. You found some of the financial tabulations useful.

GEORGE GUISE



10 March 1987

JOHN FAIRCLOUGH'S R&D PAPER OF 17 FEBRUARY

This paper is not about the amount spent on R&D nor the priorities of expenditure. It is a plea for a simpler, tighter management system for allocating and controlling the Government research effort.

The current system is both chaotic and anarchic with over a dozen Civil Departments, five Research Councils, the University Grants Committee and the Ministry of Defence all arguing for their own PES allocations and then deciding about how it should be spent. In particular, the research councils are like so many warring barons, each complaining that the other's expenditure is a waste of money. These feuds have become particularly vicious over recent years as the real Government allotment to R&D has been perceived as falling. I have set out in the appendix how these individual allocations of money are spent in terms of basic and applied research and development. They come together in the grand total of £4.6 bn spent in the last year.

Such a system for allocating R&D funds is highly dependent upon internal politicking, and the relative strength of individual personalities. It is unlikely to serve the two key principles which I recommend when dealing with investments for which the long term returns cannot be accurately quantified:

- a. The area selected must be done well preferably by building on past success. This is the opposite of the scatter-gun, or all or nothing, approach where we do a bit of everything so that no-one is offended.
- b. Once the expenditure is allocated it must be managed professionally and not left entirely to the whims of the scientists. The goal is that as much as possible goes into the field of study rather than in administration, meetings, conferences, and all the other forms of frittering which erode a badly managed budget like termites.

Fairclough's Proposals

It is unsurprising that Fairclough has attacked the structural tangle which underlies Government's allocation of R&D money. At IBM, which has an

outstanding track record for effective R&D, he supervised the work of 9,000 research staff, reporting to him through six levels of management. In essence, he now argues that there should be a single advisory body covering the whole R&D spectrum from basic research to industrial application. This advisory body (an enhanced form of ACARD) would provide the input to an executive allocating mechanism in the form of a cabinet committee (an enhanced form of E(RD)). The total R&D budget would then be allocated both by the category of activity, ranging from basic science to development, as well as by which organisation does the spending. Money would therefore be allocated and reported against according to a grid system as set out below and in more detail in the appendix.

R&D EXP. IN 1985/86 FIGURES IN £m	BASIC SCIENCE	APPLIED STRATEGIC	APPLIED SPECIFIC	DEVELOP- MENT	TOTAL
Civil Depts	47	214	430	294	984
Res Councils	283	193	62	-	540
UG Committee	487	106	77	-	670
MOD	-	35	348	2006	2388
Govt Total	817	548	917	2300	4582
88/89 level in 85/86 £m	791	525	886	2131	4334
% Annual Cutback (real)	3.3	4.6	3.7	7.8	5.8

Fairclough believes that this organisational change could be achieved with minimum disruption. For instance, the ABRC (the Advisory Board for the Research Councils), the UGC and the Civil Departments would remain the administrative system for disbursements once the overall grid pattern had been established.

Comment and Recommendation

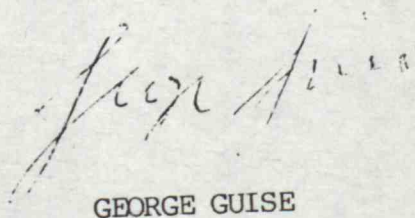
Fairclough is asking for an annual science plan, analogous to a nationalised industry's corporate plan, which would be settled annually and run for several years ahead. Once the plan were accepted, the individual departmental allocations would be made by the Treasury as part of the PES procedures.

E(RD) and ACARD would become the overlords of Government R&D expenditure. It would therefore be essential for these organisations to be strengthened. In particular, ACARD would need to be seen to be served by outstanding

industrialists and academics. Furthermore, the Chairmanship of E(RD) would be a key matter best handled by a Cabinet Minister without any particular spending department allegiance, such as the Chancellor, the Chancellor of the Duchy, or even the Prime Minister in the capacity of Minister for Science.

Fairclough's plan achieves much of what the House of Lords Committee seek but without a new bureaucratic council imposed from above. There is much the paper does not address which will need to be examined soon. For example, there is a strong case for privatisation of the Government Research Laboratories which would take the contractor/customer principle to its logical conclusion. Indeed, Fairclough's excellent observations on the Ministry of Defence in Paragraph 13 all but make this case for the whole of military research and development! The overall level of the R&D budget itself must be decided as well as the future of specific projects like CERN and JET.

John Fairclough's proposals are therefore no panacea. They make a start on the organisational problem which obscures many fundamental questions about value for money. Fairclough's whole career has been in the management of scientific effort and here are some concrete proposals which should be heard. They will not be universally popular. In particular the DES may feel threatened. The Treasury will also be highly suspicious of any system which could eventually challenge its final allocation to Departments in the PES process. What is certain is that Fairclough has an impossible task in making any of this happen without your strong personal support for his plan. He will not be asking for this tomorrow but he will be expecting some view of whether you think this is where we should be going. I think it is.



GEORGE GUISE

Appendix: The Government R&D spend in 1985/86.

APPENDIX

R&D EXPENDITURE IN 1985/86 FIGURES IN £m	BASIC SCIENCE	APPLIED STRATEGIC	APPLIED SPECIFIC	DEVELOP- MENT	TOTAL
MAFF	6.4	22.2	46.7	46.4	121.7
DES (excl. UGC)	-	-	8.0	6.8	14.9
D/Em (excl. UKAEA)	5.0	9.0	7.7	13.3	34.8
UKAEA	-	39.4	130.9	19.4	189.6
DoE	-	4.2	33.6	6.4	44.2
ODA	-	-	24.0	0.0	24.0
DHSS	-	8.9	15.6	2.9	27.4
HSC	-	0.3	5.0	2.2	7.5
Home Office	-	0.3	12.8	1.0	14.2
DTI	4.3	112.6	73.2	177.3	367.4
D/Tp	-	1.1	22.8	0.8	24.7
NI Depts	0.5	2.1	9.6	1.5	13.8
Scottish Depts	13.5	8.0	27.0	6.5	54.9
Other	17.2	6.2	12.5	9.4	45.3
SUB TOTAL - CIVIL DEPTS	46.9	214.1	429.4	294.0	984.3
AFRC	29.1	20.4	-	-	49.5
ESRC	10.9	6.4	1.6	-	18.9
MRC	39.2	41.4	40.9	-	121.5
NERC	49.8	12.2	3.1	-	65.2
SERC	154.2	112.4	16.6	1.2	284.5
SUB TOTAL - RES COUNCILS	283.3	192.8	62.2	1.3	539.7
UG Committee etc	486.6	105.8	77.4	-	669.8
TOTAL - CIVIL R&D	816.7	512.8	569.1	295.2	2193.8
MOD	-	34.5	348.0	2005.8	2388.3
TOTAL - ALL GOVT	816.7	547.2	917.1	2301.0	4582.1



ACARD

ADVISORY COUNCIL FOR APPLIED RESEARCH AND DEVELOPMENT
70 Whitehall London SW1A 2AS

March 1987

1. The Advisory Council for Applied Research and Development (ACARD) was established in 1976 and met for the first time in January 1977. The decision to set up the Council was announced in a memorandum (No 25) to the Select Committee on Science and Technology (Science Sub-Committee) by the then Lord Privy Seal. Notes on the current membership and terms of reference and a list of the published reports of the Council to date are given below.
2. The Council Chairman is normally an independent member and the post has been held by both industrial and academic members of the Council. The members are appointed by the Prime Minister, usually for a period of 3 years. In addition, the Chief Scientific Adviser, Cabinet Office acts as an assessor to the Council and attends its meetings, as do the Chief Scientists of the Departments of Energy, Trade and Industry, the Environment and the Ministry of Defence. The Council's Secretariat is provided by the Cabinet Office, Science and Technology Secretariat.
3. The full Council normally meets six times a year for half a day, but much of its work is carried out in small working groups. The membership of such groups is drawn partly from the Council and partly from non-members who can make a special contribution to the subject under review. Typically, a working group will meet monthly for six to twelve months, and will seek both written and oral evidence to aid its enquiry. The subjects for Working Group investigations are generally chosen by the Council itself although the reports on "Exploiting Invention" and "Improving Research Links between Higher Education and Industry" were requested by the Prime Minister. ACARD reports are submitted to the Prime Minister, usually with a recommendation that the report be published. When the Government instituted the procedure for carrying out an annual review of all Government funded R&D in 1982, ACARD were invited to submit independent advice on the review to Government: that advice remains confidential and is not published. However, the Chairman of ACARD periodically writes a report jointly with the Chairman of the Advisory Board for the Research Councils, and their report includes comments on the annual review and on scientific opportunities.

4. ACARD's original terms of reference were revised and extended in 1982 and are now -

"To advise the Government and publish reports as necessary on -

- i. applied research, design and development in the United Kingdom;
- ii. the application of research and technology, developed in the United Kingdom and elsewhere, for the benefit of both the public and private sectors in accordance with national economic needs;
- iii. the co-ordination, in collaboration with the Advisory Board for Research Councils, of these activities, with research supported through the Department of Education and Science;
- iv. the role of the United Kingdom in international collaboration in the fields of applied research, design and development related to technology".

5. In April 1986, ACARD subsumed within its remit the Information Technology Advisory Panel (ITAP) which had been set up by the Prime Minister in June 1981 to provide an external viewpoint to Government during the developing years of Information Technology.

6. ACARD Working Groups are currently studying, amongst other subjects, optoelectronics and defence R&D.

Bankers
1

Ind's
6

Academics
4

Tus
1

Cons
2

Leverhulme Trust
1

+ Chairmen
7

ACOST

R.S

6. The members of the Council are:

Sir Francis Tombs FEng
(Chairman)

Chairman, Rolls Royce plc

Mr Andrew Bain FRSE - *ec-academic!*

Group Economic Adviser, Midland Bank plc

X Mr Matthew Bullock

Corporate Finance Director,
Barclays Bank plc

X Mr John Coplin FEng

Director of Design,
Rolls Royce Ltd

Professor Gordon Edge

Managing Director, Generic Holdings Ltd

Mr Anthony Gill FEng

Group Managing Director,
Lucas Industries plc

Mr Eric Hammond OBE

General Secretary, Electrical,
Electronic, Telecommunications, and
Plumbing Union

X Mr Geoffrey Lomer CBE

Technical Director,
Racal Electronics plc

Professor Stan Metcalfe

Professor of Economics,
Manchester University

Dr Dennis Oliver CBE

Consultant

Professor Sir David Phillips FRS

Professor of Molecular Biophysics,
University of Oxford: Chairman of the
Advisory Board for the Research Councils

Mr Charles Read CBE

Independent Consultant

Dr Charles Reece

Director of Research and Technology,
Imperial Chemical Industries plc

Sir Rex Richards FRS

Director, Leverhulme Trust

Professor Desmond Smith FRS FRSE

Professor of Physics,
Heriot Watt University;
Chairman, Edinburgh Instruments Ltd

Terry Harrison

NET

David McMurry

Reishaw

David Smith

3

Consultant

Graham Hills

V.C. Strathely

7. The Council's published reports, available from HM Stationery Office, are:
- The Applications of Semiconductor Technology (1978)
 - Industrial Innovation (1979)
 - Joining and Assembly: The Impact of Robots and Automation (1979)
 - Technological Change: Threats and Opportunities for the UK (1980)
 - Computer Aided Design and Manufacture (1980)
 - R and D for Public Purchasing (1980)
 - Biotechnology (1980)
(with the Royal Society and the Advisory Board for the Research Councils)
 - Information Technology (1980)
 - Facing International Competition: The Impact on Product Design of Standards, Regulations, Certification and Approvals (1982)
 - The Food Industry and Technology (1982)
 - Exploiting Invention (1981) (available from ACARD)
 - Improving Research Links between Higher Education and Industry (1983)
(with the Advisory Board for the Research Councils)
 - First Joint Report by the Chairmen of the Advisory Council for Applied Research and Development and the Advisory Board for the Research Councils (Cmnd 8957)(1983)
 - New Opportunities in Manufacturing: The Management of Technology (1983)
 - Exploitable Areas of Science (1986)
 - Software - A vital key to UK competitiveness (1986)
 - Medical Equipment (1986)
 - The Science Base and Industry: Second Joint Report by the Chairmen of the Advisory Council for Applied Research and Development and the Advisory Board for the Research Councils (Cm34)(1986)



10 DOWNING STREET

Prime Minister

These papers are
much less daunting than
they look. Brian Urwin's
brief covers the ground
fully, and the decisions
needed should be
reasonably straightforward.

DKW

30/6.

CCB/108

P 02755

PRIME MINISTER

First Meeting of E(ST): 1 July 1987Scene-Setting

This is the first meeting of the new Sub-Committee, and you will want to set the right tone from the start. As you know, some Departments (notably, the Ministries of Defence, Energy and Agriculture) are nervous lest E(ST)'s activities interfere undesirably (in their view) with their own R&D budgets; and the Treasury are worried about pressures for more public expenditure. A number of colleagues may, therefore, be all set to defend their own corners.

2. You will want to make clear from the start that this Sub-Committee is going to take a hard new look at priorities across the board; that this will lead to transfers of resources between departments; and that to make this work Ministers must take a broad view of what is best for Britain as a whole, and not just for their own Departments.

3. If you agree, therefore, it would be helpful if you felt able at the beginning of the meeting to make a statement on the lines of the speaking note attached below at Annex A. This would set the tone firmly on the above lines; and we would, of course, record the statement in the minutes as a guide for the Sub-Committee's future work. As you will see, the statement registers that final spending decisions must be taken within PES but that this Sub-Committee's work will be a major new input to it.

Agenda for this first meeting

4. There are two agenda items. These are:

- (i) terms of reference and composition of the Advisory Council on Science and Technology (ACOST) (E(ST)(87)4);

(ii) the Government's response to the Report on Civil R&D by the House of Lords Select Committee on Science and Technology (E(ST)(87)1, 2 and 3).

5. Detailed briefs on both these items are attached below. So far as ACOST is concerned, I hope you will be able to secure agreement to the Chief Scientific Adviser's proposals very quickly, subject to final settlement of names and any other points outside the Committee. The urgent need is to get this Council up and running.

6. There should not be too much disagreement either about the response to the House of Lords Report. As set out in the brief below, however, there are a few points on which you may need to have some discussion. These are:-

(i) whether DTI should be committed to publish the results of the review of their role in innovation, including R&D, in industry;

(ii) whether and how the draft response might be strengthened to take more explicit credit for last year's decision to constrain defence R&D spending;

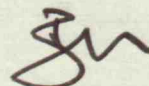
(iii) whether the Treasury/Inland Revenue study of tax treatment of R&D expenditure should be published;

(iv) whether to accept Mr Baker's proposals for handling the ABRC report on a strategy for the science base.

Further Meetings

7. You may wish to aim provisionally for a further meeting of the Sub-Committee before the recess, to consider a first overview report by the Chief Scientific Adviser on priorities. This will, however, depend on the progress it proves possible to make.

Cabinet Office
30 June 1987



J B UNWIN



RESTRICTED

SPEAKING NOTE FOR THE PRIME MINISTER AT THE FIRST MEETING OF E(ST)

We said in the Manifesto that R&D spending needs to be better targetted, and that we would ensure this. This Committee's job is to make sure that this happens.

2. I therefore look to the Committee urgently to tackle the following:-

- First, it must be prepared to take a clear view on R&D priorities ^{Government} across the board. This means viewing priorities ^{together} horizontally rather than ^{departmentally} vertically, and I shall ask the Chief Scientific Adviser to put proposals to us;

- Second, once these priorities have been established, the Committee must also take a view both on particular major projects and on the allocation of resources between Departments. Final spending decisions must, of course, be taken as part of the public expenditure survey process; but this Committee must provide the informed input to that process that has hitherto been lacking.

3. We shall not be short of expert advice. The new Advisory Council on Science and Technology (ACOST) will have a particularly important role to play. But we shall not succeed unless each Minister on this Committee is ready to take a broad view of what is best for Britain as a whole, and not just for his own Department's

programme; and is willing to accept allocation and transfer of R&D resources accordingly. I shall look to you all to cooperate in this.

4. The first agenda item is a Note on the Terms of Reference and Composition of ACOST, which I have just mentioned. I hope we can endorse it straightaway so that the new Council can get to work at once. Mr Fairclough will be consulting your Departments separately on names.



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Terms of Reference and Composition of the Advisory Council
on Science and Technology (ACOST)

E(ST)(87)4

DECISIONS

You will wish the Sub-Committee to:-

- (a) endorse the terms of reference of ACOST as set out in paragraph 2 of E(ST)(87)4;
- (b) agree the broad composition of ACOST as proposed in paragraphs 4 and 5 of E(ST)(87)4 and invite the Chief Scientific Adviser to consult Departments on names; and
- (c) endorse the role proposed for ACOST in advising on science and technology priorities, as described in paragraph 6 of E(ST)(87)4.

DISCUSSION

2. The terms of reference and broad composition of ACOST have been agreed by nearly all the main Departments at senior official level. There have, however, been some very late comments from the Treasury (proposing a formula explicitly to direct ACOST to advise on the quality and effectiveness of science and technology in the UK in both public and private sectors) and from the Department of Education and Science (proposing an alternative form of words for ACOST's role in advising on international science and technology). Neither of these changes seems to us to be necessary, but if the Chief Secretary or Mr Baker raises them, you might ask the Chief Scientific Adviser to settle them with the Departments concerned out the Sub-Committee.
3. As far as the names of ACOST's members are concerned, these can also be sorted out separately between the Chief Scientific Adviser

and Departments. But of course if any member of the Committee has any specific suggestions, it would be helpful to let the Chief Scientific Adviser know very quickly.

4. The Chief Scientific Adviser proposes that Sir Francis Tombs, the ACOST Chairman, be invited to advise on national science and technology priorities by the end of the year. The proposal should be readily acceptable to the Sub-Committee.

HANDLING.

5. I suggest you ask the Chief Scientific Adviser briefly to introduce the paper and express the hope that it can be agreed very quickly so that the new council can be established and operational without delay.

Cabinet Office
30 June 1987



CONFIDENTIAL

Government Reponse to Report of House of Lords Select Committee
on Civil Research and Development

E(ST)(87)1

Tax Treatment of R&D Expenditure: An International Survey

E(ST)(87)2

Strategy for the Science Base: A Report by the
Advisory Board on the Research Councils

E(ST)(87)3

DECISIONS

The main decision for the Sub-Committee is whether to publish as a White Paper the draft response to the Report on Civil Research and Development (R&D) by the House of Lords Select Committee on Science and Technology circulated under a covering note from the Chief Scientific Adviser (E(ST)(87)1).

2. Specific points on the text that may require discussion and decision are:-

(i) whether DTI should be committed to publishing the results of their review of the Department's role in innovation, including R&D, in industry (paragraph 23);

(ii) the presentation of the balance between civil and defence R&D funded by the Government (paragraph 4 and 32);

(iii) whether to publish the Treasury/Inland Revenue study on tax treatment of R&D expenditure (paragraph 23 of the draft response; the report itself is circulated under the Chief Secretary's memorandum E(ST)(87)2);

(iv) whether to publish the report by the Advisory Board for the Research Councils (ABRC) circulated by the Education Secretary under cover of E(ST)(87)3, and what should be said on publication (paragraph 16 of the draft response).

BACKGROUND

3. The Select Committee's Report was published on 8 January and was debated in the House of Lords on 19 February. A summary of its recommendations lies at Annex B of E(ST)(87)1. The report has attracted a fair amount of media interest; the Times, Guardian, Independent, Financial Times, New Scientist, Nature and other scientific journals all carried articles when the report was published. There has also been TV coverage. Media interest has mostly concentrated on the Select Committee's fears about the erosion of the science base and the 'brain drain', the need for coordination within Government of the R&D budgets and individual Departments (especially the DTI, DES and MOD) and the case for greater investment in civil R&D by industry and Government.

MAIN ISSUES

4. The Chief Scientific Adviser's Note (E(ST)(87)1) covers a draft Government response to the report. Its main feature (paragraphs 6 - 12) is the new strengthened central structure. The draft has been agreed at official level, but I suggest you invite discussion on the points listed in paragraph 2 above where differences might emerge between Ministers. These are discussed below.

DTI's Review of its Role in Innovation

5. The Select Committee recommended an increase in the total amount of DTI support for industry. The draft response (paragraph 23) says that DTI is reviewing its role in supporting and encouraging innovation, including R&D, in industry and that the results will be announced in a future publication. The Trade and Industry Secretary may resist this. But the Chief Scientific Adviser favours such a commitment both as a means of spurring DTI into action and to forestall criticism of an otherwise weak response on this major recommendation of the Select Committee. There is, of course, a risk of embarrassment if at the end of the review DTI have little to say. On the other hand, there are bound to be questions about the outcome of the review, once its existence is known. A compromise would be to

delete the specific reference to "a future publication" so as to keep the Government's options open. The Chief Scientific Adviser would accept this, provided the Trade and Industry Secretary is ready to bring proposals on the outcome of DTI's review to E(ST) once it is completed.

Balance (Civil/Defence) of Government-Funded R&D

6. In his note, the Chief Scientific Adviser suggests the Government's response (paragraphs 4 and 32) might place greater stress on the need to switch resources from defence to civil R&D and take credit for the reduction in the real level of defence R&D over the next decade (consistent with E(A)'s decision last year that the total volume of resources devoted to defence R&D should be reduced in accordance with projections in the 1985 Long Term Defence Costings). There is much to be said for this; despite their genuine difficulties, the Ministry of Defence have been remarkably coy about this important change of policy so far.

7. If the Committee support this, you could ask Mr Fairclough to agree a more explicit form of words with the Defence Secretary. Two minimum drafting changes could be as follows:-

(i) on paragraph 4 amend the second sentence to read (additions underlined):

- "While the Government recognise the importance of increasing civil R&D as a share of public R&D and are taking action accordingly by restraining the real level of defence R&D, the primary problem is the low level of industry's investment in R&D."

(ii) On paragraph 32 expand the final sentence to read:-

No, surely not. It implies that money will be transferred out of the defence budget, or, at least, it will be taken as implying that. CONFIDENTIAL

"These policies are intended to lead to a gradual reduction in the real level of defence R&D over the next decade, which should increase the resources available for civil R&D."

8. These additions would stress the positive features of Government policy in this area and should be reinforced by the 1987 Annual Review of Government funded R&D (see Annex C of E(ST)(87)1, which is due to be published in early autumn and which shows civil R&D rising slightly as a percentage of total Government R&D from 48.9% in 1986/7 to 50.1% in 1989/90. You should be aware, however, that MOD have recently sought to revise their figures for the Annual Review upwards by using a much more generous index than the normal GDP one to ~~convert the LTC 85 ceilings to cash.~~ The effect of this would be to push up the defence R&D figures by more than £200m in 1989/90 (with proportionate increases in the earlier 2 years) and to cause civil R&D to fall as a percentage of total Government R&D. The Defence Secretary may argue that the E(A) decision last year related to the volume of defence R&D resources and that it is legitimate to use an index appropriate to the defence industry to convert these volume figures to cash. But this special pleading (if not sharp practice) is not consistent with the normal public expenditure rules. I recommend you reject any such request from the Defence Secretary.

Tax Incentives

9. The Select Committee recommended that the Government examine tax incentives for R&D expenditure. In his Memorandum on the Tax Treatment of R&D expenditure (E(ST)(87)2), the Chief Secretary agrees to the publication of the study by Treasury and Inland Revenue officials of the tax treatment of R&D spending in 10 developed countries. The Chief Secretary is also content with paragraph 27 of the draft response to the House of Lords. You may want to establish, however, that this does not necessarily preclude further consideration of the possibilities in the appropriate budgetary context.

Handling of the ABRC Report

10. The Secretary of State for Education and Science has circulated the ABRC's strategy document separately under cover of E(ST)(87)3. It is an impressive report, which sets out an imaginative strategy towards higher education. But it is bound to be controversial (in particular, the proposal that all higher education institutions

should be differentiated by research role into 3 main types) and it does have public expenditure implications.

11. The only operational decision needed at this stage is whether the report should be published before the summer recess as Mr Baker recommends. E(ST) colleagues are likely to agree to this. If the report were not published, its contents would almost certainly leak, and the Government would be put on the defensive; and informed public discussion should help the Government reach detailed decisions in due course.

12. On publication, Mr Baker proposes to issue a short statement reserving the Government's position on the detailed recommendations, while reaffirming the Government's policy of securing maximum returns from public expenditure on scientific research and improved management of research effort in higher education. He proposes to invite comment from the scientific community and others by mid-autumn and to undertake to make a full response to the report (on which he will consult colleagues further) in the light of these consultations.

13. The Sub-Committee may be willing to endorse this approach. The thrust of the document is certainly in the direction Ministers have seemed to favour. You will want to be satisfied, however, that Mr Baker's broad endorsement of the report does not undesirably prejudice the Government's eventual response or the outcome of the forthcoming PES round. There will be pressures for more spending and the Chief Secretary will no doubt have views on this.

Mr Baker strongly asks for endorsement of the recommendations "broadly and in principle".

14. You may also wish to invite the Sub-Committee's views on the suggested commitment in paragraph 16 of the draft reply to a "future publication" on the Government's management of the science base. There is an argument for keeping the options open on how best to announce the Government's conclusions in due course. On the other hand, you will wish to bear in mind that the White Paper on "Higher Education" published in April 1987 said (in paragraph 3.20) that the improvements achieved and in train in higher education would "be set out in greater depth in future publications".

NEXT STEPS

15. If the Sub-Committee agree the draft response, subject to any points in discussion , you will wish to ask the Chief Scientific Adviser to arrange publication as soon as possible, consulting your office (Mr Ingham) and the other key Departments on the precise timing. The Government's reply to the last report on science and technology by the Lords Select Committee was laid before the Commons by you on 2 July 1982. The proposal is to follow this precedent with the present report. There may be pressure for a debate in the Commons on R&D (Mr Kinnock called for one on 19 February, the day when the Lords debated the Select Committee's report).

HANDLING

16 You will wish to invite the Chief Scientific Adviser, Cabinet Office, to present the draft response to the Select Committee's report. The Secretary of State for Trade and Industry will wish to respond. The Chief Secretary, Treasury will wish to speak to his paper on tax incentives. The Secretary of State for Education and Science will wish to draw colleagues' attention to the proposed handling of the ABRC Report. Other Ministers may also wish to comment.

Cabinet Office
30 June 1987

RESTRICTED

POSSIBLE SPEAKING NOTE FOR THE PRIME MINISTER AT THE FIRST
MEETING OF E(ST)

The first agenda item is a Note setting out the terms of reference of this Sub-Committee and its relationship with the Public Expenditure Survey (PES) process; and the membership and terms of reference of the new Advisory Council on Science and Technology (ACOST).

2. This Note reflects extensive consultation between myself and some of the Ministers most directly concerned, and also between officials of their departments. I hope we can endorse it straight away.

3 E(ST)'s predecessor - E(RD) - made a good start in furthering the contribution of individual departmental R & D programmes to the wider benefit of the economy. But there is a long way to go if we are to match our competitors and to get much better value for the nation from the resources we put into R & D. I therefore want this Sub-Committee urgently to tackle the following:-

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- First, it must establish a rational basis for decisions on Government R & D priorities across the board. In future, we must view priorities horizontally rather than vertically, and I shall ask the Chief Scientific Advisor to put proposals to us;

- Second, once these priorities have been established, the Sub-Committee must be ready, in conjunction with the established PES process, to take a clear view on both total expenditure on R & D and on its allocation between departments.

Final decision in PES

4. In addition to the advice we shall get from the Chief Scientific Advisor, we shall also in due course have the benefit of an expert and independent view of priorities from ACOST. But we shall not succeed unless each Minister on the Sub-Committee is ready to take a broad view of what is best for Britain as a whole, and not just for his own department's programme; and to accept allocation and transfer of R & D resources accordingly. I shall look to you all to co-operate in this.



10 DOWNING STREET

Prime Minister 4

From this week's
New Scientist.

It looks as though
the review of CBR will
propose very small reductions,
if this is accurate.

DWS
26/6.

Disappointing - we
shall have to reduce
by more than
that,
not

THIS WEEK

CERN told to axe research staff

THE EUROPEAN Centre for Nuclear Research (CERN) will lose up to 15 per cent of its staff within two years, if recommendations made by a review committee last week are accepted by the countries that collaborate at the centre. But how these savings will affect the overall budget and, in particular, the dispute over Britain's contribution is still unclear.

The decision to review the workings of CERN was made in February last year, following a report by a British committee headed by Sir John Kendrew. The Kendrew report questioned whether Europe was getting value for money from CERN and recommended a cut of 25 per cent in contributions from all the countries involved.

In May of last year, CERN appointed an international committee of scientists and industrialists to advise the centre on managerial housekeeping.

The review committee, chaired by Anatole Abrogam of the French Atomic Energy Commission, presented a preliminary report last week to the council of CERN. The report advocates that "considerable long-term savings could be effected in the years to come through improved management and a reduction in personnel costs".

The report underlines the scientific excellence of the work done at CERN, which has brought several Nobel prizes, but criticises the management of research. It recommends several ways of reducing the budget, beginning by limiting the number of permanent research posts. The commit-

Nina Hall

tee says that no more permanent posts should be granted for one year.

Secondly, plans to retire early or make redundant 100 staff within the next two

that he was impressed with the serious way the committee had undertaken the review. However, it was not clear how CERN's strategy on spending will affect the British contribution, which is likely to be about £50 million in 1988. The biggest reduction that Britain could expect from staff cuts and better management would be about £8 million. This would leave Britain paying much more than the £30-£35 million contribution recommended by Kendrew.

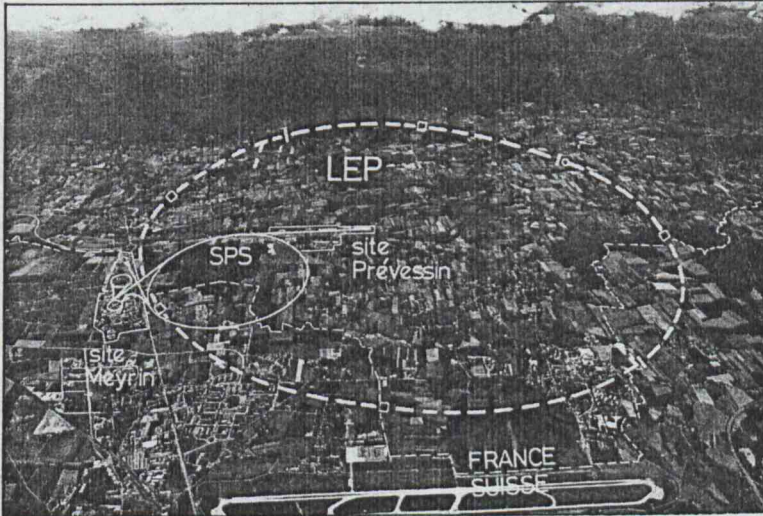
The Science and Engineering Research Council is due to meet in July to discuss Abrogam's findings. It will have to make some hard decisions. Last year, the council threatened to recommend withdrawing from CERN unless the British government subsidised the losses from fluctuating exchange rates on international subscriptions.

Britain's contribution to CERN, which is paid in

Swiss Francs, soared from £45 million to £60 million last year because of a fall in the value of the pound. Many scientists say that this sum, which represents 20 per cent of the total SERC budget, is too much.

A spokesman for CERN said that no one there had ever considered the possibility of Britain leaving. "It would be like the US pulling out of NATO," he said.

Britain has other international collaborations to consider this year. The provisional council of the European Synchrotron Radiation Facility, to be built at Grenoble, needs an agreement on its funding for instance. □



Redundancy may deny Britons the chance to use the LEP in 1988

years should be expanded to 600 people. The total staff at CERN is 3500. Also, professional managers should be hired to advise the scientists who currently govern CERN.

However, CERN should not cut back on its technical expertise. It should continue to develop its own technology rather than buy in technical knowhow, as happens in the US. One physicist points out that experiments always work first time at CERN while in equivalent American laboratories, new experiments on new equipment take more time to produce useful results. This is good news for scientists and technicians currently working on CERN's new electron-positron collider, LEP, due to be ready in 1988.

Abrogam said that the committee could not calculate exactly what savings could be made by staff cuts. It has therefore asked the director general of CERN, Herwig Schopper, to study the feasibility of its recommendations and to produce a detailed financial strategy before December, when the review committee is due to make its final report.

By then, CERN's members will know whether any cuts in the overall budget are likely. According to CERN, the preliminary report considers that "the comprehensive research programme should be continued in its entirety and that there should be no *a priori* reduction in the organisation's budget".

The staff account for half the centre's costs, so a 15-per-cent reduction in staff would produce only a 7.5 per cent reduction in total costs—which is far short of the 25 per cent recommended by Kendrew.

Bill Mitchell, the chairman of Britain's Science and Engineering Research Council and a member of the CERN council, said

OBSERVER David Austin


WHY BOTHER? THE M25 IS BIGGER, AND GENERATES MORE COLLISIONS.

THE CERN ACCELERATOR

ENHANCES THE PRESTIGE OF EUROPEAN SCIENCE



P 02749

bc ~~cc~~ Nagrole
cc BG 
From: J B UNWIN
26 June 1987

DR WALKER

cc Mr Monger

CERN

I attach an article on CERN in this week's ~~New Society~~ *Scientist* (No)??
printing
error

2. I spoke to Sir David Hancock about where matters now stand. He told me that he had agreed with Mr Fairclough that DES would put a paper to E(ST)(O) at the end of July. This should make it possible for a further paper to be prepared for consideration by Ministers in E(ST) after the summer recess.

3. This seems to provide sufficient time for a decision to be made to withdraw from CERN from 1 January 1989 if Ministers so wish. You will recall that a full years notice has to be given. I fear, however, that the outcome of the Abrogam report does not look very promising. Although a cut of up to 15 per cent on staff is recommended, this will not necessarily lead to any financial savings overall.

4. Would you please keep a very close eye on this to ensure that the timetable does not slip. Ideally, of course, Ministers ought to take a collective view of this in time to inform the Chief Secretary's bilaterals before the Star Chamber.



J B UNWIN



file EL3B2Q

CCB9

10 DOWNING STREET

LONDON SW1A 2AA

From the Private Secretary

SIR ROBERT ARMSTRONG

SUB-COMMITTEE ON SCIENCE AND TECHNOLOGY (E(ST))

The Prime Minister has seen your minute to me of 25 June which proposed revised terms of reference for the new Sub-Committee on Science and Technology as follows:

To review policies and priorities on science and technology, both domestically and through international collaboration, and to consider the consequent allocations of resources between Departments."

The Prime Minister is content with these terms of reference.

You explained that the reason for the proposed amendment to the terms of reference was the danger of seeming to give the Sub-Committee the right to pre-empt decisions which have in practice to be taken in the public expenditure exercise. For the same reason, the Prime Minister does not wish to circulate to E(ST) the proposed detailed arrangements for interaction between E(ST) and the PES process which have been discussed between officials. She feels that it would in any case not be sensible at this early stage to attempt to lay down a rigid procedure for the operation of the Committee. She remains however firmly of the view that the Committee must be prepared to take a clear view on priorities for research and development and to take decisions which will lead to the transfer of resources between Departments. Moreover, its views will be an important input into the public expenditure survey itself.

(125)

The Prime Minister will I am sure herself take a close interest in the handling of bids for extra spending on science and technology as they are processed during the public expenditure survey, drawing on her experience as Chairman of E(ST).

The Prime Minister intends to introduce the discussion at the first meeting of E(ST) by pointing to the need for the Committee to view priorities horizontally rather than vertically and to take a view both on particular major projects and on the allocation of resources between Departments. The decisions taken by the Committee will result in some cases in an actual transfer of expenditure and in others in recommendations which will need to be taken into account during the public expenditure survey. She will wish to stress that each Minister will be expected to take a broad view of what is best for Britain as a whole and not just of his own Department's programme; and to accept allocation and transfer of R & D resources accordingly.

It would be helpful if in providing briefing for the Prime Minister's use at the first meeting of E(ST) a speaking note could be provided along these lines.

DW

DAVID NORGROVE

26 June 1987

Ref. A087/1861

MR NORGROVE

Sub-Committee on Science and Technology (E(ST))

The terms of reference of the new Sub-Committee proposed in your minute of 19 June have created some disquiet in the Treasury, who feel that the phrase "to decide the consequent allocations" is in danger of seeming to give the Sub-Committee the right to pre-empt decisions which have in practice to be taken in the public expenditure exercise.

2. I wonder if the Prime Minister would settle for:

"To review policies and priorities on science and technology, both domestically and through international collaboration, and to consider the consequent allocations of resources between Departments."

RA

ROBERT ARMSTRONG

Sir Robert Armstrong

The Prime Minister feels very strongly about this. I don't think she would be persuaded to change her drafting.

25 June 1987

JKW
25/6.

136/6

Ref. A087/1861

MR NORCROVE

cc - Mr Unwin
Mr Fairclough

File

Sub-Committee on Science and Technology (E(ST))

The terms of reference of the new Sub-Committee proposed in your minute of 19 June have created some disquiet in the Treasury, who feel that the phrase "to decide the consequent allocations" is in danger of seeming to give the Sub-Committee the right to pre-empt decisions which have in practice to be taken in the public expenditure exercise.

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"To review policies and priorities on science and technology, both domestically and through international collaboration, and to consider the consequent allocations of resources between Departments."

RA

ROBERT ARMSTRONG

25 June 1987



CONFIDENTIAL

cc BQ

P 02745

From: J B UNWIN

25 June 1987

MR NORGROVE - No 10

SUB-COMMITTEE ON SCIENCE & TECHNOLOGY (E(ST))

I understand that the Chancellor of the Exchequer proposes to raise the question of E(ST) at his meeting with the Prime Minister later today. This note may help to fill in the background.

2. The particular causes of Treasury excitement appear to be the Terms of Reference of the Sub-Committee (as approved by the Prime Minister) and the proposed provision in the statement of interaction between E(ST) and PES for a "small but rising uncommitted provision". For ease of reference, I attach a copy of the texts in question; sub-paragraph (iii) in the PES text refers to the uncommitted provision.

3. The initial Treasury inclination was to seek changes both to remove the words "to decide" from the terms of reference (on the basis that expenditure decisions can only be taken in PES); and to remove entirely the proposal for an uncommitted provision. On second thoughts, however, I believe that the Chancellor may offer to accept these but on the strict condition that bids for spending on science and technology can only be submitted through E(ST). This would entail deleting the second half of sub-paragraph (iii) and in effect putting a complete ring fence round R&D spending within E(ST).

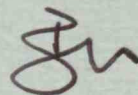
Comment

4. I see no objection to removing the offending words in sub-paragraph (iii). In a sense, they are otiose since it is always open to Ministers to submit additional PES bids if they wish. But I do not think it would be right to add to the text (if this is what the Chancellor seeks) any explicit exclusion of this. It would simply not be realistic and would accord to E(ST) a specific expenditure

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role well beyond what is realistic or, I think, the Prime Minister had in mind.

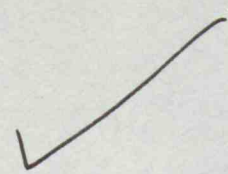
5. To sum up, therefore, if the Chancellor presses, the words "but this would not preclude Ministers from putting forward their own additional PES bids for expenditure on science and technology" could be removed from sub-paragraph (iii). But the rest should stay as it is. The Sub-Committee will in any case have an opportunity to consider these proposals collectively at their first meeting which we are seeking to arrange next Wednesday (1 July).



J B UNWIN

Cabinet Office

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SUB-COMMITTEE ON SCIENCE & TECHNOLOGY

Terms of Reference

"To review policies and priorities on science and technology, and to decide the consequent allocations between departments of resources, both domestically and for international collaboration".

Timetable for E(ST) Decisions and the Public Expenditure Survey

The detailed arrangements for interaction between E(ST) and the PES process are as follows:

(i) provision for science and technology will be considered by E(ST) in parallel with the early stages of the Public Expenditure Survey;

(ii) in the first half of the year, (E(ST) will review departmental S&T plans and programmes taking account among other things of advice received from the proposed Advisory Council on Science and Technology (ACOST);

(iii) E(ST) will seek to establish with departments a small but rising uncommitted provision to serve as a flexible margin against departmental bids, but this would not preclude Ministers from putting forward their own additional PES bids for expenditure on science and technology;

(iv) by the end of June, E(ST) will seek to reach agreement on priorities for Government expenditure on science and technology in the Survey period. In reaching their conclusions on this, they will consider whether to indicate any transfer between departments which in their view would

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make it possible to give effect to these priorities; and may also express a view on the appropriate total expenditure provision;

(v) the Chief Secretary will take account of E(ST)'s views in his report to the Cabinet in July and they will then inform detailed discussion of programmes in the autumn;

(vi) the Chief Secretary should give a general description of the emerging position on science and technology in any report he makes to the Star Chamber or Cabinet on progress of these bilaterals;

(vii) in seeking to resolve outstanding differences between the Chief Secretary and Ministers on S&T issues the Star Chamber will take account of E(ST)'s views and will report on the S&T position when it reports back to Cabinet;

(viii) following the Autumn Statement E(ST) will begin a new review of departmental programmes concentrating on the three years to be covered in the coming Survey round;

(ix) the Public Expenditure White Paper will include a passage on S&T expenditure.

File

DSG

PROFESSOR GRIFFITHS

cc: Mr. Sherbourne

SCIENCE AND TECHNOLOGY

The Prime Minister wanted a short paragraph about the Government's proposals on science and technology. I think the best thing I can do is simply to pass you copies of the two minutes below.

DNS

David Norgrove

8 May 1987

DG2BYM

M



Ref. A087/1275

MR NORGROVE

Science and Technology

Your minute of 6 ^{at flap} May seeks advice on a paragraph about the proposed new arrangements for dealing with the determination of priorities in allocation of Government resources for science and technology.

2. I suggest the following:

Government support for research and development is larger as a share of our national income than in the United States, Japan or Germany. We shall make arrangements to ensure that these resources are deployed to the best advantage of our economic efficiency and competitiveness.

3. I am sending copies of this minute to Mr Unwin, Mr Fairclough and Mr Guise.

RTA

ROBERT ARMSTRONG

8 May 1987

SCIENCE Budget Pts



COMMUNICATIONS SECTION

11

PERSONAL



file

GA

10 DOWNING STREET
LONDON SW1A 2AA

From the Private Secretary

SIR ROBERT ARMSTRONG

SCIENCE AND TECHNOLOGY

The Prime Minister has asked for a paragraph, based on the proposals made by the Chief Scientific Adviser for reorganising the way in which priorities for science and technology are set, of a length which might be included in a Manifesto.

A possible paragraph might be along the following lines:

"Government support for research and development is larger as a share of our national income than in the United States, Japan or Germany. But these resources need to be better targetted. We shall ensure that spending is firmly directed towards areas of high national priority, drawing on a full range of advice from business and from our universities and polytechnics."

This would be greatly improved by a sentence which indicated what those priorities might be. But here there seems some uncertainty in present policy. On the one hand the Prime Minister points to technologies which should now be being developed and exploited by business but where the research is still being carried out in the public sector (eg gallium arsenide chips). On the other hand we argue that R&D should increasingly be directed towards areas which have worthwhile economic potential. But if they really do have economic potential, should not, ex-hypothesi, a company be developing them, rather than the public sector?

A possible sentence to insert after the word "targetted" would be:

"The task of Government is to support basic research and research where business cannot realistically be expected to carry all the risks."

BK// I should be grateful for comments by mid-day on Friday please.

I am sending a copy of this minute to Brian Unwin and John Fairclough (Cabinet Office) and to George Guise (No.10 Policy Unit).

DW

David Norgrove

6 May 1987

PERSONAL

file SKW
CCBQ



10 DOWNING STREET
LONDON SW1A 2AA

From the Private Secretary

SIR ROBERT ARMSTRONG

NATIONAL PRIORITIES FOR SCIENCE AND TECHNOLOGY

The Prime Minister this morning discussed with the Secretaries of State for Trade and Industry and Education and Science and the Chief Secretary the proposals for new arrangements to decide national priorities for science and technology described in a paper by the Chief Scientific Adviser attached to my letter of 29 April to Mr. Channon's Private Secretary.

The Prime Minister wishes to proceed with the creation of the proposed new Cabinet Committee, E(ST), and with the creation of a new body, ACOST, to replace ACARD.

The Prime Minister would be grateful for your advice on the membership and terms of reference of the proposed new Committee. She would also be grateful if, consulting the Departments of Trade and Industry and Education and Science and the Treasury as necessary, you could now prepare detailed proposals on the membership and terms of reference of ACOST.

The Prime Minister would wish, if there is a General Election and the present Government is returned, to hold the first meeting of the new Committee very soon after the Election.

A reply to the report by the Select Committee of the House of Lords on science and technology would also need to be agreed in the early weeks after the Election.

I am copying this minute to Jill Rutter (Chief Secretary's office), Rob Smith (Department of Education and Science), Tim Walker (Department of Trade and Industry), Brian Unwin (Cabinet Office) and John Fairclough (Chief Scientific Officer).

DNS

(DAVID NORGROVE)
6 May 1987

sh

PRIME MINISTER

NATIONAL PRIORITIES FOR SCIENCE AND TECHNOLOGY

This meeting, with Mr. Channon, Mr. Baker and the Chief Secretary, is for preliminary discussion of John Fairclough's proposals on new machinery for deciding national priorities for science and technology. It is intended as a softening of the ground before the proposals go to E(RD), which is chaired by Mr. Channon.

You might:

- (i) hear any criticisms by your colleagues and talk them through;
- (ii) agree that the proposals, revised as necessary, should be discussed in E(RD) quickly, in time for a sentence or two in the Manifesto and for use in an election campaign;
- (iii) Cabinet Office, during an election campaign, should develop the proposals in greater detail, in consultation with DTI and DES and the Treasury;
- (iv) E(RD) after an election should finalise the reply to the House of Lords Select Committee, and clear this with you before submission.

You will remember that the essence of the proposals is for a new Committee, sometimes chaired by you, to take an overview of the whole of Government R&D, basing itself on advice from an expanded ACARD.

I would expect both Mr. Channon and Mr. Baker to welcome the proposals in principle. However, Mr. Baker may be concerned about the reaction to the loss of independence of the Research Councils. More generally, the battles in this area are likely to come when individual Ministers are expected to surrender

resources to their colleagues.

The Chief Secretary is likely to be concerned first by the way in which R&D would be to some extent separate from other expenditure and secondly by the idea that the new Committee, E(ST), should seek to establish a mini-contingency reserve for science. On the first point, you could point out that final decisions on departmental provision would still be taken within the Public Expenditure Survey. The proposal for a mini-contingency reserve is not essential to the scheme, but you could say that since E(ST) will be attempting to manage priorities across the board in a unique way, its work would be helped if it enjoyed a little greater flexibility than other areas of spending.

You may want to make it clear that you have an open mind on the proposals for separate Green or White Papers on management of the science budget and measures to stimulate industrial R&D, which are ideas floated in John Fairclough's draft reply to the House of Lords.

ls. Stevens

DUTY CLERK

PP DAVID NORGROVE

5 May 1987

NATIONAL PRIORITIES FOR SCIENCE AND TECHNOLOGY: Note by Chief Scientific Adviser

1. This note describes proposals for establishing national priorities for science and technology and considers how they might be presented in the Government's response to the House of Lords Report. The proposals build on existing machinery, in particular the Sub Committee for Research and Development E(RD) and the Advisory Council for Applied Research and Development (ACARD).

Objectives of new structure

2. These should be:

- i. to develop a rational basis for deciding on priorities spanning different Departments' programmes and to avoid the need for ad hoc decisions;
- ii. to have sufficient influence over the implementation of these decisions, particularly their financial implications in the Public Expenditure Survey.

Proposals

3. My proposals for achieving these objectives are as follows:-

- a. the Government's determination to set national priorities for science and technology should be presented as an important economic initiative in their response to the House of Lords. The new machinery is described in the draft White Paper at Annex D;

Ministerial Committee

- b. because this is such an important initiative, I recommend the Prime Minister should chair the successor to E(RD). Having a Minister from one of the spending Departments in the chair will always be awkward;
- c. the terms of reference of E(RD) should be extended to cover expenditure on technology transfer as well as on R & D. The Committee, which might be renamed the Sub-committee on Science and Technology E(ST) would then have responsibility from science right through to the exploitation stage. Suggested new terms of reference are at Annex A; E(ST) would be served by an Officials' Committee which would replace two existing committees, the Committee of Chief Scientists (STO(CS)) and the Official Committee on Research and Development (E(RD)(0));

Advisory Body

- d. the terms of reference of ACARD should be extended to give it the same coverage as E(ST), in particular to cover basic science and technology transfer in addition to applied research. It should be renamed ACOST (Advisory Council on Science and Technology).

Suggested new terms of reference are at Annex B;

- e. ACOST should report to the Prime Minister, as ACARD does at present, and the Prime Minister should hold periodic meetings with the Council;
- f. ACOST should establish links with Departments' own Advisory Bodies and Departmental Ministers should be asked to keep under review their terms of reference and their need for separate advisory bodies;

Reaching Agreement on Priorities

- g. E(ST) should seek advice from ACOST on the disposition of the Government's R & D expenditure and on areas where the UK has relative strengths both in the underlying science and technology and also in its capability to exploit. Further advice might be sought elsewhere eg from ACARD's initiative on the Exploitation of Science and Technology for which industry will provide the majority funding;
- h. E(ST) should undertake a rolling annual review of Departments' science and technology programmes and plans and the disposition of the funds concerned in the light of this assessment of relative strengths. The Science and Technology Assessment Office, under my command, would assist in this;
- i. the Annual Review should lead to agreement on priorities for science and technology. A statement of these priorities should be published in the Public Expenditure White Paper each year;

Implementation and PES

- j. E(ST) should reach its judgments on priorities by the end of June in order to recommend before the Cabinet decision on the Survey in July any transfers between Departments needed to give effect to these priorities. Its views on the total appropriate PES provision for science and technology and the merits of individual Departmental bids would be available for the Chief Secretary to take into account in his bilaterals with spending Ministers;
- k. E(ST) should seek to establish with Departments a small but rising uncommitted provision to serve as a flexible margin against departmental bids;
- l. final decisions on Departmental provisions would be taken within the Survey.

4. I attach at Annex C a more detailed timetable showing how E(ST)'s work would link across to the Survey process.

House of Lords: Draft Response

5. I attach at Annex D the latest draft of the response to the House of Lords Report. The Committee recommended that a Minister in the Cabinet should be designated to be responsible for the science and technology dimension of Government policy and the promotion of national effort in R & D. It also proposed the establishment of a Council of Science and Technology under the the Prime Minister's chairmanship with the designated Minister as deputy. This was to oversee the whole of science and technology, to absorb ACARD and submit an annual science and technology statement to Parliament.

6. The proposals described in paragraphs 5-9 of the draft response meet the underlying point of the Committee's recommendations without the need to create new Ministerial responsibilities or establish a new advisory body. Extending the role of the existing ACARD with some enlargement of its membership is a much easier way to meet the same objectives.

7. The Committee also had a number of other recommendations, the most important of which were concerned with the management of the Science Budget and with measures the Government could take to stimulate more industrial R & D. The present draft of the response suggests that the Government should undertake to prepare separate Green/White papers on these two issues.

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Annex A

Existing terms of reference for E(RD)

To develop policies to enhance the contribution of R & D expenditure, public and private, to improving the efficiency, competitiveness and innovative capacity of the United Kingdom economy; to evaluate the contribution of Government-funded R & D activities to the Government's economic objectives; to assess the impact of Government procurement policies on the shape and content of United Kingdom R & D activity in both public and private sectors; and to make recommendations on R & D priorities.

Proposed terms of reference for E(ST)

To consider and keep under review policies for science and technology, to identify priorities and to make recommendations on the allocations of public expenditure for science and technology.

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Annex B

Existing terms of reference for Advisory Council on Applied Research and Development (ACARD)

To advise the Government and publish reports as necessary on -

- (i) applied research, design and development in the United Kingdom;
- (ii) the application of research and technology, developed in the United Kingdom and elsewhere, for the benefit of both the public and private sectors in accordance with national economic needs;
- (iii) the co-ordination, in collaboration with the Advisory Board for Research Councils, of these activities, with research supported through the Department of Education and Science;
- (iv) the role of the United Kingdom in international collaboration in the fields of applied research, design and development related to technology.

Proposed terms of reference for Advisory Council on Science and Technology (ACOST)

To advise the Government on priorities for science and technology in the United Kingdom; to advise and publish reports as necessary on

- (i) the application of science and technology, developed in the United Kingdom and elsewhere, for the benefit of both the public and private sectors in accordance with national economic needs;
- (ii) the coordination, in collaboration with Departmental Advisory bodies, of these activities, with related activities in Departments;

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(iii) the role of the United Kingdom in international collaboration in science and technology.

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Annex C

Timetable for E(ST) Decisions and the Public Expenditure Survey

The detailed arrangements for E(ST) to interact with the PES process might be as follows:-

- (i) provision for science and technology will be considered by E(ST) in parallel with the early stages of the Public Expenditure Survey;
- (ii) in the first half of the year, E(ST) will review Departmental S & T plans and programmes taking account among other things of advice received from the proposed Advisory Council on Science and Technology (ACOST);
- (iii) E(ST) will seek to establish with Departments a small but rising uncommitted provision to serve as a flexible margin against Departmental bids but this would not preclude Ministers from putting forward their own additional PES bids for expenditure on science and technology;
- (iv) by the end of June, E(ST) will seek to reach agreement on priorities for Government expenditure on S & T in the Survey period and will, if necessary, express a view on the appropriate total expenditure provision for the Survey period. In reaching their conclusions on this they will also consider whether to recommend any transfers between Departments which in their view are necessary to give effect to these priorities;
- (v) the Chief Secretary will take account of E(ST)'s recommendations in his report to the Cabinet in July and, subject to the outcome of that Cabinet, during his bilaterals in September;

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- (vi) the Chief Secretary will give a general description of the emerging position on S & T to the Star Chamber and to Cabinet when he reports back on the results of his bilaterals;
- (vii) in seeking to resolve outstanding differences between the Chief Secretary and Ministers on S & T issues the Star Chamber will take account of E(ST)'s recommendations and will report on the S & T position when it reports back to Cabinet;
- (viii) following the Autumn Statement E(ST) will begin a new review of departmental programmes concentrating on the three years to be covered in the coming Survey round;
- (ix) the Public Expenditure White Paper will include a passage on S & T expenditure.

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Annex D

24 APRIL DRAFT

GOVERNMENT RESPONSE TO THE REPORT BY THE SELECT COMMITTEE OF THE HOUSE OF LORDS ON SCIENCE AND TECHNOLOGY ENTITLED "CIVIL RESEARCH AND DEVELOPMENT"

1. The Government are grateful to the House of Lords Select Committee on Science and Technology for their important and considered review of the policy and practice of public support for civil science and technology in the United Kingdom. The main thrust of the Select Committee's report is contained in their opening recommendations, in particular that: the advance of science and technology, which is essential to the economic recovery of the country, must be a central objective of Government policy (7.1); a new impetus, requiring action at the highest level of Government, is needed to raise the morale and focus the effort of the scientific community and industry (7.2); neither Government nor industry is spending enough on R & D to restore the United Kingdom's industrial position in world markets (7.3); and Departmental policies and spending on research and development must be looked at horizontally across the whole of Government (7.4).

2. The Government agree that science and technology are increasingly important in helping them fulfil their responsibilities; however science and technology serve wider Government policy objectives, just as industry invests in R & D in order to increase market share or profitability. Government support for basic science and enabling technology, particularly in the universities, is intended to lead to the acquisition of knowledge and development of skills which will have a major impact on the United Kingdom's industrial position in world markets. But public investment in science and technology will not achieve economic benefit unless industry undertakes the applied research and development to capitalise on this investment. The Government therefore accept that it should be a major national priority to focus the effort of the scientific community and industry on increasing the effectiveness of our national investment in science and technology. The Government do not believe

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that the key consideration is the level of funding but the effective management of the existing effort. The challenge is to direct scientific and technological resources without constraining individual creativity and to coordinate related parallel research and development programmes without divorcing them from the individual objectives they are meant to serve.

3. As far as investment in research and development by industry is concerned, the Government have created a climate within which this is able to flourish. With inflation brought down and significant improvements achieved in company profitability, liquidity and capacity utilisation, companies are better placed to invest in future commercial success, including innovation and the exploitation of research and development. The Government hope that industry will take ^{action on} ~~note~~ of the Select Committee's conclusion that industry is not spending enough on R & D.

4. The three main themes running through the Government's support of civil science and technology are the importance of maintaining and enhancing quality in science and technology activities; increasing the economic and social contribution from science and technology to national output; and better management, greater concentration and selectivity of science and technology activities. The measures described in this paper, particularly those under Central Structure, are designed to secure these objectives more effectively.

CENTRAL STRUCTURE

5. The Government agree with the Select Committee that there is no call for the creation of a separate and all embracing Science and Technology Ministry (6.21). The Committee state that it is the arrangements for the science and technology dimension at Cabinet level which ought to be strong, but believe there is no uniquely suitable arrangement, appropriate for all time and for all those who would have to operate it (6.23 and 6.24). The Government have already recognised the need for a horizontal overview of Government Funded R & D in their response to the Select Committee five years ago (Cmd 8591). It was primarily for this purpose that the Annual Reviews of Government Funded R & D were introduced. As a further development, a searching review of R & D

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priorities across Government, defence as well as civil, is being undertaken in order to enable Ministers to decide on changes in the size and shape of departmental R & D programmes, with the objective of increasing the contribution of Government-funded R & D towards improving the efficiency, competitiveness and innovative capacity of the United Kingdom economy. Further changes are proposed in line with the Select Committee's recommendations 7.5, and 7.6. Rather than establish new machinery these will extend and enhance that which already exists.

6. The main components of the strengthened central structure to be established by the Government are twofold; first, collective, high level Ministerial consideration of science and technology priorities and, second, an expanded independent advisory body, reporting to the Prime Minister, which will comment and advise "across the whole of scientific and technological endeavour, international as well as British." The Government will each year determine a set of national priorities for science and technology against which different Departments' allocations for R & D will be assessed. These priorities, together with details of expenditure provision for future years, will be published in the Government's Public Expenditure White Paper.

7. The advisory body will be based on an expanded Advisory Council for Applied Research and Development (ACARD) which will therefore be absorbed within it. The Select Committee recommended the establishment of a Council on Science and Technology. The Government propose to achieve this by enhancing existing machinery rather than setting up a new body. The main change to ACARD will be the widening of its terms of reference to embrace all science and technology and this will be reflected in the membership which will include distinguished academic scientists. To reflect the enlargement of its role, ACARD will be renamed the Advisory Council on Science and Technology (ACOST), and its terms of reference will be:

"To advise the Government on priorities for science and technology in the United Kingdom; to advise and publish reports as necessary on:

i. the application of science and technology, developed in the United

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Kingdom and elsewhere, for the benefit of both the public and private sectors in accordance with national needs;

ii. the coordination in collaboration with Departmental Advisory Bodies, of these activities with related activities in Departments;

iii. the role of the United Kingdom in international collaboration in science and technology."

8. Building on the existing role of ACARD to submit advice on departmental research programmes and budgets in the context of the Annual Review of Government Funded R & D, ACOST will provide advice annually on priorities for science and technology which will contribute to Government decisions.

9. The Committee of Departmental Chief Scientists, chaired by the Chief Scientific Adviser, which was established in response to the recommendation of the Select Committee five years ago (as announced in Cmnd 8591), will be enlarged. It will continue to be concerned with the overall policy and management of science and technology within Government and with co-ordination of research programmes; and in future will consider departmental programmes within the context of the overall priorities identified by Ministers on the advice of ACOST.

10. The Science and Technology Assessment Office, whose formation the Committee welcomed (7.19), will provide assistance with this work. Its role is to encourage Departments, the Research Councils and the University Grants Committee (UGC) to devote more effort to assessing their R & D expenditures and evaluating their results. This is intended to help those who are responsible for spending public money on R & D to establish clearer objectives for future expenditure and develop and improve the criteria against which new and on-going projects are assessed and managed. A further important function will be to ensure that all bodies involved in public R & D have regard to the economic impact and commercial exploitation of the work supported as well as its national benefit. Through direct participation in this work, the Assessment Office will be expected to build up a picture of the relative contribution of

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the different R & D expenditures to the United Kingdom's competitive position and will be responsible for contributing advice on these matters to the new, strengthened central structure.

11. The Committee recommend that approximately 1% of all Government R & D expenditure should be devoted to evaluation (7.20). It is difficult to say what is the right percentage of Government R & D expenditure to devote to this. It depends in part on how much of the administrative and decision making process is treated as "evaluation". The Science and Technology Assessment Office will be identifying and encouraging best practice amongst Departments in regard to procedures and will be considering how much effort should be put into the various stages of the assessment process.

RESEARCH COUNCILS AND HIGHER EDUCATION

12. The Government welcome the main thrust of the Select Committee's recommendations for increased harmonisation of Research Council procedures (7.7); strong management and clear decisions about priorities between Research Councils (7.8); evolutionary progress, possibly leading to eventual unification of the Research Councils (7.9); fostering further collaboration between higher education institutions and industry (7.30); the UGC selectivity exercise (7.31); and closer links between Government research establishments and Research Council institutes and higher education institutes (7.33). As a nation the United Kingdom can no longer afford to engage in world class science in all subjects in all universities. The cost of research - particularly the capital cost - inevitably increases while the scientific opportunities expand at a growing rate. At any realistic level of resources selectivity is essential.

13. Individually the Research Councils have made progress in the identification of priorities and more active management of resources, including substantial restructuring in some cases, which they describe in the corporate plans they now publish. The UGC has embarked on a policy of selectivity of research funding in universities; and this will be taken further by the changes to be introduced following the Government's acceptance of the main thrust of Lord Croham's Report on the UGC (announced in the White Paper on Higher

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Education, Cm 114). Many universities have set up Research Committees, as recommended by the Merrison Report on the Support of University Scientific Research (1982, Cmnd 8567).

14. The Advisory Board for the Research Councils (ABRC) have set out their plans for implementing greater concentration of research resources in their Strategy document, "A Strategy for the Science Base". These include a recognition that spending on "big science", particularly particle physics and astronomy, must decline further in real terms; and plans to introduce an inter-disciplinary approach to Research Council funding and management of research in higher education institutions. As a first step in this approach, a number of multi-disciplinary university research centres will be set up, funded and managed by the Research Councils, with the involvement of industry, [and in some cases the involvement of more than one university or polytechnic in a particular area].

15. Implementation of these plans across the whole of the higher education and Research Council system will require, as the Select Committee observes (para 6.45), "strong management and clear decisions about priorities"; a more effective ABRC; and a closer coupling between the selectivity processes of UGC and ABRC. The ABRC recognise this in their Strategy document which calls for "concerted action involving both sides of the dual support system". Government proposals for the future of the science base and associated advanced training will be the subject of a white/green paper to be published later in the year. This will also address other important issues raised by the Select Committee on the role for polytechnics in research (7.32) and the output of engineers (7.35).

16. The Select Committee recommended that the research fund established by the National Advisory Body for Public Sector Higher Education (NAB) should be increased (7.32). The Government have agreed that the NAB research initiative, introduced in 1985-86, should be repeated and expanded [under the auspices of the Polytechnics and Colleges Funding Council.] In 1985-86 £2.5 million per annum was made available over a three year period allocated over 21 institutions. For 1987-88 £3.8 million has been made available, initially for

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one year only but with the expectation of being continued for the following two years. The funding is for activities of demonstrated quality in institutions which have proven track records of successful industrial and commercial involvement.

17. The Select Committee recommend that Government Departments should adopt forthwith the UGC guidelines on overhead payments in research contracts with universities (7.34). The last time the UGC issued guidelines was in 1970 and 1971 when they suggested universities should consider whether the cost charged for research contracts should be the full economic cost or some higher or lower figure. The UGC suggested that 40 per cent of total direct costs would be a useful starting point for overheads on relatively small projects. Since then the Committee of Vice Chancellors and Principals has endorsed proposals from a Working Party of the University Directors of Industrial Liaison. The present position of the Government, who are currently considering the Working Party's proposals [to be resolved before publication?] is:

"Institutions should not subsidise the clients (including Government Departments and agencies) for whom they carry out research and consultancy. Clients should normally pay not only the direct costs involved, but also an appropriate share of general overheads; any exceptions should be made consciously and only in accordance with explicit institutional policy" (1985 green paper 'The Development of Higher Education into the 1990s', Cmnd 9524, paragraph 5.14).

METHODS OF FUNDING RESEARCH

18. The Government welcome the Select Committee's support for the concept of the Science Budget (7.10); and the devotion of part of that budget to strategic areas of research offering some prospect of economic benefit (7.11). The Science Budget already makes a significant and increasing contribution to the nation's prosperity. This will be further increased through the measures described above. The white/green paper on the science base and associated advanced training will develop these themes while recognising the need to maintain the right balance between research pursued for reasons of intellectual

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curiosity and economic benefit.

19. The Select Committee recommend that the costs of superannuation, restructuring and international subscriptions should be separately itemised in the Science Budget and any significant increases met in full (7.12). These costs can be identified, and indeed the advice of ABRC to the Secretary of State for Education and Science goes a good way towards doing this publicly. The management of all these costs will be addressed in the white/green paper.

20. The Select Committee's endorsement of the customer/contractor principle for R & D funded by Government Departments is welcomed; the Government recognise the need for Departments to have adequate scientific strength for the conduct of informed dialogue with research contractors (7.13). Departments have evolved different arrangements with their research contractors in response to the Rothschild recommendation for a 10 per cent surcharge to be added to all Government contracts for commissioned research (7.14).

21. The Government welcome the Select Committee's support for strategic research in particular that which is of most significance to the United Kingdom's economic future (7.15 and 7.16); and for the 'exploitable areas of science' process (7.17 and 7.18). The importance with which the Government regard strategic research for both economic and social objectives is indicated by the fact that departmental and Research Council spending on strategic civil research was £488 million in 1984/85, nearly a quarter of total Government spending on civil research and development. The LINK programme, which was launched last December, has as a specific aim the fostering of strategic areas of scientific research directed towards the development of innovative products, processes and services by industry. Through LINK the Government will support - with expenditure reaching £210 million over the next five years - up to half the cost of collaborative programmes between the scientific community and industry and, in many cases, Government research establishments. ACARD has identified the need for a central and permanent forum to identify promising new areas of science and technology - 'exploitable areas of science' - for exploitation by industry. The Centre for Exploitation of Science and Technology (CEST) is therefore being established, essentially with support from industry

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and commerce but with some initial financial contribution from Government. [To be updated as agreement reached on setting up CEST. Expect to be able to announce the agreement of initial funding from industry and commerce, with some contribution from Government.]

INDUSTRIAL R & D

22. The Government share the Select Committee's concern that, in general, the level of R & D being funded and performed by British industry is inadequate and agree that the main responsibility for funding "D" should properly rest with industry (7.21) . The Government's primary objective is to provide the right climate to enable industry to compete effectively and to generate the resources necessary to support R & D. The devising and financing of industry's R & D and innovation programmes must largely be for industry itself since these are commercial decisions which should primarily be governed by market forces. There are, however, circumstances in which public support for R & D is justified, for example, where projects, though economically attractive, are too risky for firms to go ahead alone because of long timescales, high technical or other risks; where potential beneficiaries of the R & D, including customers, are too diffuse for a company to fund R & D unaided; and to secure a United Kingdom presence in certain key technologies or markets. The Government already provide funding across a wide range of activities, the LINK programme being the most recent. The prime need is, however, for industry to increase the level of R & D it funds; less than 59 per cent of R & D expenditure by industry in 1985 was funded from industry's own resources in the UK compared with 67 per cent in USA, 72 per cent in France (in 1984), 76 per cent in Italy, 82 per cent in West Germany and 98 per cent in Japan (in 1984). Because of the fundamental importance of industrial R & D to the growth of the economy and of the need to achieve a substantial improvement in the R & D performance of industry the Government are preparing a green paper on industrial sponsorship and R & D for publication later in the year. This green paper will address both the industrial sponsorship role of the Department of Trade and Industry (DTI) and the stimulation of private sector R & D. On the former the Government note the Select Committee's recommendation for an increase in the total amount and coverage of DTI support for industry (7.23).

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23. The Government accept the Select Committee's view that there is a need to emphasise to shareholders and managers the value of R & D (7.22) and have consistently done this in a number of ways, including the retention of the Scientific Research Allowance (when other capital allowances against corporation tax were withdrawn) and the inclusion of R & D as a qualifying activity for the Business Expansion Scheme. It is for companies though to ensure that their bankers and major shareholders understand the need for investment in R & D - an understanding which will be assisted by the reporting of R & D expenditure in annual accounts. The Government welcome the decision by the Accounting Standards Committee to publish as an exposure draft the revised Statement of Standard Accounting Practice (SSAP) 13 which would require companies to disclose in their annual statements the amounts they spend on research and development. Assuming that this leads to the adoption by the accountancy institutions of an SSAP substantially along the lines of the present draft, the Select Committee's objective (7.25) will have been effectively achieved without the need for legislation.

24. The Government agree with the Select Committee that it would be desirable to develop the statistical information available on private R & D to the standard of that on public R & D (7.28) and have already announced that from 1986 onwards sample surveys of private industry will be conducted annually with benchmark enquiries taken every four years. Information on industrial R & D and Government funded R & D will both then be available on an annual basis.

25. As the Select Committee recommend the Government have examined tax incentives for R & D expenditure (7.24). [This examination which considered the taxation arrangements in ten developed countries showed that there is no case for changing the current basis of tax incentives in the United Kingdom. Inland Revenue to provide additional wording. Treasury yet to decide whether to make public the existence of this study and its findings.]

26. The Government agree with the Select Committee on the importance of public purchasing and the contribution it can make to stimulating R & D in the private sector (7.26). Since the introduction of the Public Purchasing Initiative in

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1980 it has always been the Government's policy that public purchasers should use their influence to help improve the competitiveness of their suppliers and thus contribute to a healthy industrial base and in particular to encourage innovation. Public purchasers are already being urged by the Government to make suppliers aware of their willingness to buy "first-off" products when these will ensure value for money in the longer term. In addition the Public Purchasing Guidelines, which the Government issue to all public bodies, have recently been revised to request purchasers to indicate to their suppliers that the extent of own-funded R & D is an additional factor which will be taken into account in assessing company strength.

27. The Select Committee urge the Government to expand their present effort in aiding the inward flow of technology (7.27). In addition to their Overseas Technical Information Service, DTI introduced in 1986 the Overseas S & T Expert Mission Scheme to transfer industrially relevant science and technology information into the United Kingdom. Other improvements in this area include: S & T Counsellors, based in London but responsible for identifying technological opportunities in several countries; the Visiting Engineers' Scheme for secondments to Japan; and expansion of the TechAlert and EuroTechAlert schemes. The growing number of international collaborative projects which the Government strongly encourage and, as appropriate, support financially will play an increasingly important role in aiding the inward flow of technology.

28. The Select Committee recommend that the Government should do more to meet the R & D needs of small firms (7.29). DTI have taken a number of specific measures to help small firms, through: the Support for Innovation programme; subsidised Business and Technical Consultancy; the Small Firms Merit Award for Research and Technology; and information on international activities. The Ministry of Defence have recently announced their plans to help small firms, including their Small Firms Research Initiative. [E(RD)(O) examining schemes for supporting R & D manpower in small and medium sized enterprises.]

INTERNATIONAL COLLABORATION

29. The Government welcome the Select Committee's support for international

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collaboration in R & D (7.36). Research has become increasingly international: the increasing expense of scientific installations means that certain types of research can only proceed when costs are shared; a number of scientific problems show no respect for national frontiers, for example, in areas of human health and environmental pollution; and common research can help towards the unification of the European market in areas such as information technology and telecommunications which might otherwise be dominated by our trading competitors. The Government have already played an important role in encouraging European collaboration, for example, through industry led joint R & D under EUREKA, and the European Community (EC) industrial programmes [to be redrafted when EC Framework Programme agreed.] The Select Committee raised three points on the Treasury rules relating to EC R & D funding, while accepting the principles lying behind these rules (7.36). The new central structure machinery outlined above will address the role of the United Kingdom in international collaboration in science and technology, and in this context will be able to consider whether there is a case for amending or clarifying these rules.

CIVIL IMPLICATIONS OF DEFENCE R & D

30. The civil and defence R & D budgets are already recorded separately, as the Select Committee recommends, in the Annual Review of Government Funded R & D (7.37). The Government agree that their size should be determined by the civil and defence programmes which they support and by the nature and objectives of those programmes (7.37). The Select Committee recommend a thorough examination of defence R & D expenditure (7.37). ACARD have already embarked on such a study with particular emphasis on increasing industrial benefits from this expenditure. The new central structure machinery will keep under regular consideration science and technology priorities for both civil and defence R & D. [To refer to decision to reduce defence R & D drawing on the text to appear in the Statement on the Defence Estimates.]

31. Efforts to increase spin-off from defence R & D are an important objective for the Government (7.38). While the primary role of defence R & D is to support the procurement of equipment for the Armed Forces, it also makes an

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important contribution to the broader national economy to the extent that work is conducted for civil customers or for exports; technologies are developed with civil as well as defence applications; enabling technology work is contracted out to industry; jointly-resourced research programmes are undertaken with DTI and industry; research grants are financed jointly with the Research Councils; and science parks can be developed adjacent to research establishments. Defence Technology Enterprises Ltd (DTE) has rapidly established itself as an effective channel between the work of Ministry of Defence (MOD) scientists and engineers and civil industry; after its first full year of activity, DTE now has some 450 items of exploitable technology on its database.

32. The Government accept the need to keep security constraints on technology transfer from defence to civil applications to the minimum necessary to protect vital defence interests (7.39). In practice it is often possible to draw a distinction between dissemination of technology (which can usually be permitted) and weapons and equipment applications of technology where more restrictions apply. The Select Committee recommended the publication of a more detailed annual report on the results of defence R & D (7.39). The MOD are planning to produce a separate annual report, in addition to the Statement of the Defence Estimates, in the form of an information brochure on the defence research programme.

CONCLUSION

33. The Select Committee have recommended a high profile for science and technology, dynamic leadership at the centre, and a new approach to funding R & D (7.40). The Government are confident that the strengthened central structure arrangements set out in this response will achieve the Committee's first two objectives. On the new approach to funding R & D, the Government already have means of funding strategic research; they hope that industry will contribute to the new Centre for Exploitation of Science and Technology. CEST will provide guidance on exploitable areas of R & D which industry and Government can combine in funding. In addition the Government are planning further developments in the fundamentally important areas of the science base and

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associated advanced training, and industrial sponsorship and R & D, which will be described in two green papers [one white, one green?] later in the year. Together these major initiatives will stimulate the culture change which is required in industry, science and technology for success in the 1990s.

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10 DOWNING STREET
LONDON SW1A 2AA

29 April 1987

From the Private Secretary

NATIONAL PRIORITIES FOR SCIENCE AND TECHNOLOGY

RS I understand that John Fairclough, Chief Scientific Adviser, has already discussed with your Secretary of State his ideas for changing the way in which priorities for science and technology are determined. I now attach a paper which the Prime Minister believes would serve as a useful basis for a meeting of Ministers which has been arranged for Wednesday next week.

I am copying this letter and enclosure to Mike Eland (Lord President's Office), Jill Rutter (Chief Secretary's Office, H.M. Treasury), Rob Smith (Department of Education and Science), John Fairclough (Chief Scientific Adviser) and to Trevor Woolley (Cabinet Office).

DAVID NORGROVE

Timothy Walker, Esq.,
Department of Trade and Industry.

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CC/SG
cc B.Y.P

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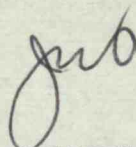
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MR NORCROVE

29 April 1987

NATIONAL PRIORITIES FOR SCIENCE AND TECHNOLOGY

1. I attach a version of my minute to the Prime Minister as requested.
2. I have discussed with Mr Unwin how a reference to the Committee "disposing" of the Government's R & D budget might be introduced into the paper in a way that would be workable within the existing systems and have agreed on the references in 3(g) and 3(h) of the note to E(ST) being concerned with the "disposition of the Government's R & D expenditure". We think that this should meet the Prime Minister's point without challenging too overtly the Treasury's PES responsibilities and Departments' management autonomy.
3. I am copying this minute to Sir Robert Armstrong.



JOHN W FAIRCLOUGH
Chief Scientific Adviser

att

SUBJECT
cc master

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bc BG.

10 DOWNING STREET
LONDON SW1A 2AA

From the Private Secretary

MR. JOHN FAIRCLOUGH

NATIONAL PRIORITIES FOR SCIENCE AND TECHNOLOGY

The Prime Minister this morning discussed with you your minute to her of 24 April about national priorities for science and technology. Sir Robert Armstrong, Mr. Brian Unwin and Mr. George Guise were also present.

The Prime Minister warmly welcomed your proposals. She expressed some scepticism about the Green and White Papers floated in your minute and attachments, but agreed to allow them to go forward for further discussion. She agreed to chair early meetings of E(ST) and thereafter to chair important meetings. She would need one or two effective deputy chairmen to take other meetings.

The Prime Minister said it must be clear that the research budgets of individual departments should be regarded effectively as being at the disposal of E(ST). It was recognised that the committee's detailed control over R & D in the Ministry of Defence would be less strong than in the case of other departments. The Prime Minister agreed with you on the need to transfer to industry large areas of research at present carried out in research establishments. MOD would however need to retain a broad range of capabilities in order to be able to decide the direction of future weapons procurement, to draw up cardinal points specifications and to test the claims and performance of its supplying companies.

It was agreed that Sir Francis Tombs should transfer from ACARD to ACOST as its Chairman. Departments, industry and the research councils would all need to be involved in ACOST.

You said some additional money would be needed to pay for restructuring of science in universities, for example in the promotion of multi-disciplinary research.

It was agreed that E(ST) would need to determine priorities in terms of functional spending. Money would then be allocated to spending authorities. It would not be possible to determine spending by the research councils in detail, but they would need to be given guidance possibly to the extent of requiring expenditure of a particular sum in a particular area of research.

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BM

The Prime Minister agreed to discuss your proposals with the Secretaries of State for Trade and Industry and Education and Science, and the Chief Secretary as a prelude to a wider discussion in E(RD).

As we discussed, you will be letting me have a clean version of your minute and its attachments with revised opening paragraphs and a further revision to make it clear that members of E(ST) would be expected effectively to make their research budgets available for allocation by the committee.

I am copying this minute to Mr. Unwin and Mr. Woolley (Cabinet Office) and to Mr. Guise (No.10 Policy Unit).

Dhw

DAVID NORGROVE

29 April 1987

PRIME MINISTER

RESEARCH AND DEVELOPMENT

Brian Unwin and I have both had a hand in the preparation of John Fairclough's paper and we agree that his structure should prove to be workable. Treasury scruples will have to be overridden.

But can I reinforce Robert Armstrong's doubts about whether you should take the chair at many of the meetings of E(ST)? This would be an extremely time-consuming committee, and, equally important, I am sure it is not good for your own position to be drawn more frequently than need be, into conflicts over public expenditure.

DJW

(DAVID NORGROVE)

28 April 1987



CCB/UP

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Ref. A087/1194

PRIME MINISTER

National Priorities for Science & Technology
(Chief Scientific Adviser's minute of 24 April)

DECISIONS

You will need to decide:

(i) whether the proposals for changes in the Ministerial Committee structure and other arrangements are acceptable;

(ii) whether the draft response to the House of Lords Select Committee Report forms an acceptable basis for the Government's reply;

(iii) how both (i) and (ii) above should now be taken forward.

MINISTERIAL COMMITTEE STRUCTURE

2. It would be wrong to under-rate the work of E(RD) which is chaired by the Secretary of State for Trade & Industry. Most crucially, it has consolidated the work on defence R&D and put the Defence Secretary under severe pressure to introduce an effective new R&D control system in his Department. It has also - albeit slowly - begun to change the general R&D "culture", making it obligatory now for Ministers to justify their R&D programmes not simply against their own departmental requirements but against their contribution to the wider performance of the economy as a whole.

3. But progress in some areas has undoubtedly been slow. This is not just a function of the existing machinery. A number of other factors are relevant, such as:-

(i) tenacious defence of their existing R&D policies and expenditure provisions by Departmental Ministers (you saw this at work in the discussions on Space);

(ii) lack of policy agreement on where any additional resources should be concentrated, even if they could be liberated.

No amount of changing the machinery or Committee structure will make Ministers more willing to give up resources from their own programmes unless a more dirigiste regime for allocating resources at the centre is set up than I imagine you would be prepared to see.

Effectiveness of the New Proposals

4. The key question, therefore, is to what extent the new proposals will in practice prove more effective than the present ones. In general, I believe they will be an improvement, particularly given the wider terms of reference for E(ST), the wider remit proposed for ACARD, and the arrangements for dovetailing consideration into the PES round. It would, however, be a mistake to suppose that they will suddenly revolutionise R&D priorities and allocation of resources and I would advise particular caution on the following points:-

(i) Chairmanship of E(ST): you will, of course, have your own views on this. I suggest, however, that it might be prudent to limit the occasions on which you take the Chair. There will be a lot of routine business to process (eg detailed scrutiny of individual departmental programmes) and the key meeting will obviously be that to consider the Annual Review. You could confine yourself to this and leave the Chair at most other meetings normally to be taken by a

senior non-Departmental Minister (eg the Lord President or the Chancellor of the Duchy). A formal procedural compromise (as with E(LF)) would be to nominate yourself as Chairman, but on the explicit basis that another nominated Minister would take the Chair in your absence (and would in practice be expected to handle the routine business).

(ii) Relationship with PES: the draft at Annex C is based on discussions with the Treasury. I believe that it is for the most part workable and negotiable with the Treasury. But I suspect that the Chief Secretary may raise more objections than Mr Fairclough's minute suggests. In addition to opposing the idea of an uncommitted margin, the Chief Secretary will be reluctant to agree that his report to the Cabinet in July should take account of E(ST)s recommendations. The Treasury are always wary of any arrangement that might appear to isolate an area of expenditure and give it special treatment. But provided it is clearly understood that in the Chief Secretary's bilaterals and the Star Chamber R&D expenditure, whatever E(ST) may recommend, is just as vulnerable to cuts or changes as any other, I do not see why something close to Annex C should not be accepted by the Treasury.

GOVERNMENT RESPONSE TO THE HOUSE OF LORDS SELECT COMMITTEE REPORT

5. Annex D to Mr Fairclough's minute contains a draft Government reply to the House of Lords Report. Subject to the points below, I believe that this forms a good basis for the reply, but I am a little concerned about the procedure. At their last meeting E(RD) instructed Mr Fairclough to bring a draft before them for consideration. This has not yet taken place. Unless, therefore, you propose to change the present E(RD) machinery very quickly, I think it would still be sensible - if other developments permit - to allow that consideration to take place. The Chairman of E(RD) could then submit a draft approved by the Committee to you for final consideration. This will ensure that the necessary thorough interdepartmental consideration at Ministerial level takes place.

6. This raises also the question of how best to involve the Chairman of E(RD) in these present considerations. Mr Channon has not yet formally been consulted on the Chief Scientific Adviser's proposals, although he is informally aware of them. I believe that he will strongly support the thrust of what is proposed, but you may think that it would be right to speak to him yourself in the near future. It is the Committee under his Chairmanship that it is proposed to change, and the proposals could be seen as in some sense a criticism of the Committee's effectiveness.

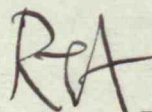
White and Green Papers

7. Paragraph 8 of the Chief Scientific Adviser's note refers to a proposal in the draft response to the Lords Report that the Government should undertake to publish separate Green/White Papers on the management of the Science Budget and Industrial R&D. I wonder whether it is wise to enter into such a commitment at the moment. Before doing so, we need to be absolutely sure that the Government will have something substantial to say. I am not aware, for example, that Mr Channon is yet convinced of the case for a Paper on Industrial Sponsorship; and there is unhappy experience of promising White Papers before Ministers have a clear idea of what they will actually say. This proposal could be considered more thoroughly together with the draft response by E(RD).

NEXT STEPS

8. Subject to the outcome of your discussion, the next step might be to convene a small meeting of senior Ministers (including Mr Channon and the Chief Secretary) to discuss the Chief Scientific Adviser's proposals. This could be on the basis of circulation of the Chief Scientific Adviser's note by your Office without explicit commitment on your part at this stage. You would need to decide the form and timing of setting up the new arrangements in the light of that meeting, but in the meantime E(RD), in its present form, could be allowed to process the response to the House of Lords Select Committee Report as planned.

28 April 1987
Cabinet Office



cc B/Up

PRIME MINISTER

28 April 1987

JOHN FAIRCLOUGH'S PAPER OF 24 APRIL

The Fundamental Issues

There is much evidence that British R&D suffers from mismanagement. This is true within Government and industry. Throwing more money at the problem is not the solution despite many clamouring for it as the easiest palliative. By far the greatest culprit is private industry which refuses to put risk capital into maintaining a modern technological base, as long as the Government is prepared to do it for them.

The underlying problem may be the pressure for short term earnings and dividends which institutional shareholders force upon companies. If true, this comes more from lack of faith in our ability to market technological achievement rather than any fundamental cynicism about the capabilities of our scientists. It is therefore another example of British management failure.

We cannot improve industrial R&D by central edicts about annual reports. What is needed is an efficient Government structure for allocating public funds which addresses the balance of responsibility between industry and Government in managing the future. The first step and one within Government's grasp is a strong attack on the methods by which public research funds are allocated and subsequently managed. Until there is an efficient and respected R&D management system no amount of public funding will be adequate.

Fairclough's paper does not address many of these issues. It concentrates on how Government can take a lead by getting its own house in order. Once this is done major issues such

as the high level of defence RD and the low level of industrial investment can be looked at.

It is easy to confuse value for money with return on capital. RD expenditure, where a return on capital is in sight, should be the last candidate for Government money. This should be reserved for fundamental discovery where pay-off is perhaps decades ahead. This does not mean that value for money cannot be defined and proper measures of research success made, but the Fairclough paper addresses none of this. It does, however, point towards the kind of administrative system which would enable these fundamental issues to be properly discussed. The present basis of allocation is continuous refereeing of inter-departmental and inter-research council arguments.

The Specific Proposals

Fairclough goes a long way towards thinking out the detailed administrative mechanism for implementing the principles which we discussed on 11 March. These were to centralise strategic priorities for research across the whole field of defence and civil activity. Extending ACARD to include basic science, in addition to its present remit on applied research, meets the House of Lord's recommendation on a Central Council for Science and Technology without yet another new body. With the re-defined ACARD (ACOST) accountable to an executive committee of the Cabinet (E(ST)) which has power to allocate funds, the fundamental machinery will be in place.

How effective this will be depends on the individual appointments. With the present structure the most able individuals will be ineffective. With the right individuals the proposed structure could work. The key appointments are the members of ACOST and the Chairman of E(ST). It has been suggested that the latter should be yourself, possibly in

the capacity of Minister for Science. Considering how many heads will have to be banged together, I doubt whether another Chairman could make such a radically new initiative work.

The ineffectiveness of E(RD) stems from its lack of fresh funds to allocate. It only has power to exhort those who have already been allocated funds to redistribute them. It also suffers from having a spending Minister in the Chair. The new E(ST) would effectively allocate by type of science across departments with ACOST providing judgemental input. The calibre of the members of ACOST will clearly need to be of the highest.

It is not reasonable to expect you to chair every E(ST) meeting and stay involved with regular detail. It is therefore important to have an appropriate Vice-Chairman who should be a senior member of Cabinet without departmental responsibility. Present candidates might be the Lord President or the Chancellor of the Duchy. However, it would be wise to avoid being specific until any restructuring of Cabinet following an election has been addressed. The key point is that the individual should be committed to making E(ST) work and have the individual clout to do so.

It might be objected that this structure does not eliminate enough of the other multitude of research councils under ABRC and we talked about the need to curtail both these and the UGC in March. However, the present proposals will effectively turn these bodies into mere allocating systems which departmental research activities will draw on for supplies and rations. The ultimate deployment of the total RD budget will already have been pre-agreed at E(ST).

The draft response to the House of Lords (annex D) indicates redefined roles for the ABRC and the UGC to be set out in a future Green Paper. This will inevitably lead to some

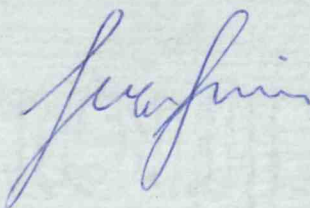
redefinition of university research and teaching structures and indeed the concept of multi-disciplinary research centres is referred to in paragraph 14. It may be too early to draw John Fairclough further on these thoughts but clearly he will need to have considerable support from the Secretary of State for Education and Science.

The draft Lord's response also talks about a new centre for exploitation of science and technology (CEST) to be funded by industry but no detail of this is given in the covering brief. Provided this is genuine industry financed R&D it sounds good. However, it must not become another Link or Alvey or Eureka where Government funds are channelled into commercially exploitable investments. Government coordination is fine but Government money should be reserved for the many kinds of valuable science which have no definable early return. On the development of CEST there will need to be common ground established between Fairclough and the Secretary of State for Trade and Industry. I understand that such talks are proceeding in parallel with those which he is having with Kenneth Baker.

Conclusion and Recommendations

1. Fairclough has made a bold attack and needs support.
2. The Lords were right in arguing that your visible backing will be necessary in order to make things happen.
3. After the initial implementation phase you must have adequate delegated arrangements at E(ST) to free you from detailed follow-through.

4. Test Fairclough on how he sees the Government expenditure balance. ~~Will he put less emphasis on commercial exploitation and channel funds to basic science?~~
5. How will he push industry to invest more?
6. What measures will he use to test an R&D programme's effectiveness when commercial exploitation is far away?



GEORGE GUISE


Appendix:

I repeat the breakdown of R&D expenditure in 1985/86 given in my previous paper of 10 March.

APPENDIX

R&D EXPENDITURE IN 1985/86 FIGURES IN £m	BASIC SCIENCE	APPLIED STRATEGIC	APPLIED SPECIFIC	DEVELOP- MENT	TOTAL
MAFF	6.4	22.2	46.7	46.4	121.7
DES (excl. UGC)	-	-	8.0	6.8	14.9
D/Em (excl. UKAEA)	5.0	9.0	7.7	13.3	34.8
UKAEA	-	39.4	130.9	19.4	189.6
DoE	-	4.2	33.6	6.4	44.2
ODA	-	-	24.0	0.0	24.0
DHSS	-	8.9	15.6	2.9	27.4
HSC	-	0.3	5.0	2.2	7.5
Home Office	-	0.3	12.8	1.0	14.2
DTI	4.3	112.6	73.2	177.3	367.4
D/Tp	-	1.1	22.8	0.8	24.7
NI Depts	0.5	2.1	9.6	1.5	13.8
Scottish Depts	13.5	8.0	27.0	6.5	54.9
Other	17.2	6.2	12.5	9.4	45.3
SUB TOTAL - CIVIL DEPTS	46.9	214.1	429.4	294.0	984.3
AFRC	29.1	20.4	-	-	49.5
ESRC	10.9	6.4	1.6	-	18.9
MRC	39.2	41.4	40.9	-	121.5
NERC	49.8	12.2	3.1	-	65.2
SERC	154.2	112.4	16.6	1.2	284.5
SUB TOTAL - RES COUNCILS	283.3	192.8	62.2	1.3	539.7
UG Committee etc	486.6	105.8	77.4	-	669.8
TOTAL - CIVIL R&D	816.7	512.8	569.1	295.2	2193.8
MOD	-	34.5	348.0	2005.8	2388.3
TOTAL - ALL GOVT	816.7	547.2	917.1	2301.0	4582.1

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PRIME MINISTER

24 April 1987

NATIONAL PRIORITIES FOR SCIENCE AND TECHNOLOGY

1. When we met on 11 March you asked me to work out in greater detail my proposals for setting national priorities for science and technology and to consider how these would be presented in the Government's response to the House of Lords Report.

Consultation

2. As you suggested, I have talked in confidence to Sir Robin Nicholson and have arranged to see Lord Dainton. I have discussed the proposals with Sir Robert Armstrong and he supports them. We have talked to Treasury officials about arrangements for translating decisions on priorities into Departmental allocations in the Public Expenditure Survey. They have consulted the Chief Secretary and have confirmed that the arrangements set out below would be workable in this respect. I am seeing the Secretary of State for Trade and Industry and the Secretary of State for Education and Science next week to talk about the draft House of Lords response and will seek their reactions to the proposals for a stronger central structure. You have already told them at the Sub-Committee on Economic Affairs (E(A)) of your intention to proceed in this direction.

Objectives of new structure

3. There are two main things the new system will have to do if it is to achieve more than the Sub-Committee for Research and Development (E(RD)):

- i. develop a rational basis for deciding on priorities spanning different Departments' programmes and avoid the need for ad hoc decisions;

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- ii. have sufficient influence over the implementation of these decisions, particularly their financial implications in the Public Expenditure Survey.

Proposals

4. My proposals for achieving these objectives are as follows:-

- a. the Government's determination to set national priorities for science and technology should be presented as an important economic initiative in its response to the House of Lords. The new machinery is described in the draft White Paper at Annex D.

Ministerial Committee

- b. because this is such an important initiative, I strongly recommend you chair the successor to E(RD). Having a Minister from one of the spending Departments in the chair will always be awkward;
- c. the terms of reference of E(RD) should be extended to cover expenditure on technology transfer as well as on R & D. The Committee, which might be renamed the Sub-committee on Science and Technology E(ST) would then have responsibility from science right through to the exploitation stage. Suggested new terms of reference are at Annex A; E(ST) would be served by an Officials' Committee which would replace two existing committees, the Committee of Chief Scientists (STO(CS)) and the Official Committee on Research and Development (E(RD)(0)).

Advisory Body

- d. the terms of reference of ACARD should be extended to give it the same coverage as E(ST), in particular to cover basic science and technology transfer in addition to applied research. It should be renamed ACOST (Advisory Council on Science and Technology).

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Suggested new terms of reference are at Annex B;

- e. ACOST should report to you, as ACARD does at present, and you could hold periodic meetings with the Council;
- f. ACOST should establish links with Departments' own Advisory Bodies and Departmental Ministers asked to keep under review their terms of reference and their need for separate advisory bodies;

Reaching Agreement on Priorities

- g. E(ST) should seek advice from ACOST on areas where the UK has relative strengths both in the underlying science and technology and also in its capability to exploit. Further advice might be sought elsewhere eg from ACARD's initiative on the Exploitation of Science and Technology for which industry will provide the majority funding;
- h. E(ST) should undertake a rolling annual review of Departments' science and technology programmes and plans in the light of this assessment of relative strengths. The Science and Technology Assessment Office, under my command, would assist in this;
- i. the Annual Review should lead to agreement on priorities for science and technology. A statement of these priorities would be published in the Public Expenditure White Paper each year;

Implementation and PES

- j. E(ST) should reach its judgements on priorities by the end of June in order to recommend before the Cabinet decision on the Survey in July any transfers between Departments needed to give effect to these priorities. Its views on the total appropriate PES provision for science and technology and the merits of individual Departmental bids would be available for the Chief Secretary to take into account in his bilaterals

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with spending Ministers;

k. E(ST) should seek to establish with Departments a small but rising uncommitted provision to serve as a flexible margin against departmental bids;

l. final decisions on Departmental provisions would be taken within the Survey, given that in some areas, notably defence, changes in the level of R & D expenditure do not necessarily have a matching effect on a Department's total provision.

5. I attach at Annex C a more detailed timetable showing how E(ST)'s work would link across to the Survey process. As I mentioned in para 2 above, Treasury officials have consulted the Chief Secretary on these arrangements and confirm that they are workable, although they would be likely to oppose the idea of a flexible margin on the grounds that this would duplicate the Contingency Reserve.

(They also have more general doubts about separating out an area of spending in this way.)

House of Lords: Draft Response

6. I attach at Annex D the latest draft of the response to the House of Lords Report. The Committee recommended that a Minister in the Cabinet should be designated to be responsible under you for the science and technology dimension of Government policy and the promotion of national effort in R & D. It also proposed the establishment of a Council of Science and Technology under the your chairmanship with the designated Minister as deputy. This was to oversee the whole of science and technology, to absorb ACARD and submit an annual science and technology statement to Parliament.

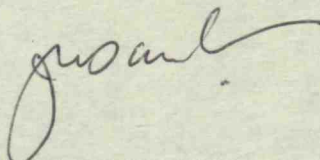
7. The proposals described in paragraphs 5-9 of the draft response meet the underlying point of the Committee's recommendations without the need to create new Ministerial responsibilities or establish a new advisory body. Extending the role of the existing ACARD with some enlargement of its membership is a much easier way to meet the same objectives.

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8. The Committee also had a number of other recommendations, the most important of which were concerned with the management of the Science Budget and with measures the Government could take to stimulate more industrial R & D. The present draft of the response suggests that the Government should undertake to prepare separate Green/White papers on these two issues. I shall be discussing this with Mr Channon and Mr Baker before we meet next Wednesday.

9. I believe the proposals I have set out above will enable the Government to establish priorities for science and technology and to get them implemented. But I would not want to underestimate the hard work that will be involved in doing this and in reordering existing Departmental programmes. I am convinced of the importance of making the necessary effort and hope that you will agree to take on personally the task of chairing the new Committee and being ready to meet periodically with an enhanced ACARD.

10. I am copying this minute to Sir Robert Armstrong.



JOHN W FAIRCLOUGH
Chief Scientific Adviser

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Annex A

Existing terms of reference for E(RD)

To develop policies to enhance the contribution of R & D expenditure, public and private, to improving the efficiency, competitiveness and innovative capacity of the United Kingdom economy; to evaluate the contribution of Government-funded R & D activities to the Government's economic objectives; to assess the impact of Government procurement policies on the shape and content of United Kingdom R & D activity in both public and private sectors; and to make recommendations on R & D priorities.

Proposed terms of reference for E(ST)

To consider and keep under review policies for science and technology, to identify priorities and to make recommendations on the allocations of public expenditure for science and technology.

Existing terms of reference for Advisory Council on Applied Research and Development (ACARD)

To advise the Government and publish reports as necessary on -

- (i) applied research, design and development in the United Kingdom;
- (ii) the application of research and technology, developed in the United Kingdom and elsewhere, for the benefit of both the public and private sectors in accordance with national economic needs;
- (iii) the co-ordination, in collaboration with the Advisory Board for Research Councils, of these activities, with research supported through the Department of Education and Science;
- (iv) the role of the United Kingdom in international collaboration in the fields of applied research, design and development related to technology.

Proposed terms of reference for Advisory Council on Science and Technology (ACOST)

To advise the Government on priorities for science and technology in the United Kingdom; to advise and publish reports as necessary on

- (i) the application of science and technology, developed in the United Kingdom and elsewhere, for the benefit of both the public and private sectors in accordance with national economic needs;
- (ii) the coordination, in collaboration with Departmental Advisory bodies, of these activities, with related activities in Departments;
- (iii) the role of the United Kingdom in international collaboration in science and technology.

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Annex C

Timetable for E(ST) Decisions and the Public Expenditure Survey

The detailed arrangements we have discussed with Treasury officials for E(ST) to interact with the PES process are as follows:-

- (i) provision for science and technology will be considered by E(ST) in parallel with the early stages of the Public Expenditure Survey;
- (ii) in the first half of the year, E(ST) will review Departmental S & T plans and programmes taking account among other things of advice received from the proposed Advisory Council on Science and Technology (ACOST);
- (iii) E(ST) will seek to establish with Departments a small but rising uncommitted provision to serve as a flexible margin against Departmental bids but this would not preclude Ministers from putting forward their own additional PES bids for expenditure on science and technology; (Note Treasury officials are opposed to the idea of a flexibility margin.)
- (iv) by the end of June, E(ST) will seek to reach agreement on priorities for Government expenditure on S & T in the Survey period and will, if necessary, express a view on the appropriate total expenditure provision for the Survey period. In reaching their conclusions on this they will also consider whether to recommend any transfers between Departments which in their view are necessary to give effect to these priorities;
- (v) the Chief Secretary will take account of E(ST)'s recommendations in his report to the Cabinet in July and, subject to the outcome of that

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Cabinet, during his bilaterals in September;

- (vi) the Chief Secretary will give a general description of the emerging position on S & T to the Star Chamber and to Cabinet when he reports back on the results of his bilaterals;
- (vii) in seeking to resolve outstanding differences between the Chief Secretary and Ministers on S & T issues the Star Chamber will take account of E(ST)'s recommendations and will report on the S & T position when it reports back to Cabinet;
- (viii) following the Autumn Statement E(ST) will begin a new review of departmental programmes concentrating on the three years to be covered in the coming Survey round;
- (ix) the Public Expenditure White Paper will include a passage on S & T expenditure.

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Annex D

24 APRIL DRAFT

GOVERNMENT RESPONSE TO THE REPORT BY THE SELECT COMMITTEE OF THE HOUSE OF LORDS ON SCIENCE AND TECHNOLOGY ENTITLED "CIVIL RESEARCH AND DEVELOPMENT"

1. The Government are grateful to the House of Lords Select Committee on Science and Technology for their important and considered review of the policy and practice of public support for civil science and technology in the United Kingdom. The main thrust of the Select Committee's report is contained in their opening recommendations, in particular that: the advance of science and technology, which is essential to the economic recovery of the country, must be a central objective of Government policy (7.1); a new impetus, requiring action at the highest level of Government, is needed to raise the morale and focus the effort of the scientific community and industry (7.2); neither Government nor industry is spending enough on R & D to restore the United Kingdom's industrial position in world markets (7.3); and Departmental policies and spending on research and development must be looked at horizontally across the whole of Government (7.4).

2. The Government agree that science and technology are increasingly important in helping them fulfil their responsibilities; however science and technology serve wider Government policy objectives, just as industry invests in R & D in order to increase market share or profitability. Government support for basic science and enabling technology, particularly in the universities, is intended to lead to the acquisition of knowledge and development of skills which will have a major impact on the United Kingdom's industrial position in world markets. But public investment in science and technology will not achieve economic benefit unless industry undertakes the applied research and development to capitalise on this investment. The Government therefore accept that it should be a major national priority to focus the effort of the scientific community and industry on increasing the effectiveness of our national investment in science and technology. The Government do not believe

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that the key consideration is the level of funding but the effective management of the existing effort. The challenge is to direct scientific and technological resources without constraining individual creativity and to coordinate related parallel research and development programmes without divorcing them from the individual objectives they are meant to serve.

3. As far as investment in research and development by industry is concerned, the Government have created a climate within which this is able to flourish. With inflation brought down and significant improvements achieved in company profitability, liquidity and capacity utilisation, companies are better placed to invest in future commercial success, including innovation and the exploitation of research and development. The Government hope that industry will take ^{action on} ~~note~~ of the Select Committee's conclusion that industry is not spending enough on R & D.

4. The three main themes running through the Government's support of civil science and technology are the importance of maintaining and enhancing quality in science and technology activities; increasing the economic and social contribution from science and technology to national output; and better management, greater concentration and selectivity of science and technology activities. The measures described in this paper, particularly those under Central Structure, are designed to secure these objectives more effectively.

CENTRAL STRUCTURE

5. The Government agree with the Select Committee that there is no call for the creation of a separate and all embracing Science and Technology Ministry (6.21). The Committee state that it is the arrangements for the science and technology dimension at Cabinet level which ought to be strong, but believe there is no uniquely suitable arrangement, appropriate for all time and for all those who would have to operate it (6.23 and 6.24). The Government have already recognised the need for a horizontal overview of Government Funded R & D in their response to the Select Committee five years ago (Cmnd 8591). It was primarily for this purpose that the Annual Reviews of Government Funded R & D were introduced. As a further development, a searching review of R & D

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priorities across Government, defence as well as civil, is being undertaken in order to enable Ministers to decide on changes in the size and shape of departmental R & D programmes, with the objective of increasing the contribution of Government-funded R & D towards improving the efficiency, competitiveness and innovative capacity of the United Kingdom economy. Further changes are proposed in line with the Select Committee's recommendations 7.5, and 7.6. Rather than establish new machinery these will extend and enhance that which already exists.

6. The main components of the strengthened central structure to be established by the Government are twofold; first, collective, high level Ministerial consideration of science and technology priorities and, second, an expanded independent advisory body, reporting to the Prime Minister, which will comment and advise "across the whole of scientific and technological endeavour, international as well as British." The Government will each year determine a set of national priorities for science and technology against which different Departments' allocations for R & D will be assessed. These priorities, together with details of expenditure provision for future years, will be published in the Government's Public Expenditure White Paper.

7. The advisory body will be based on an expanded Advisory Council for Applied Research and Development (ACARD) which will therefore be absorbed within it. The Select Committee recommended the establishment of a Council on Science and Technology. The Government propose to achieve this by enhancing existing machinery rather than setting up a new body. The main change to ACARD will be the widening of its terms of reference to embrace all science and technology and this will be reflected in the membership which will include distinguished academic scientists. To reflect the enlargement of its role, ACARD will be renamed the Advisory Council on Science and Technology (ACOST), and its terms of reference will be:

"To advise the Government on priorities for science and technology in the United Kingdom; to advise and publish reports as necessary on:

- i. the application of science and technology, developed in the United

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Kingdom and elsewhere, for the benefit of both the public and private sectors in accordance with national needs;

ii. the coordination in collaboration with Departmental Advisory Bodies, of these activities with related activities in Departments;

iii. the role of the United Kingdom in international collaboration in science and technology."

8. Building on the existing role of ACARD to submit advice on departmental research programmes and budgets in the context of the Annual Review of Government Funded R & D, ACOST will provide advice annually on priorities for science and technology which will contribute to Government decisions.

9. The Committee of Departmental Chief Scientists, chaired by the Chief Scientific Adviser, which was established in response to the recommendation of the Select Committee five years ago (as announced in Cmnd 8591), will be enlarged. It will continue to be concerned with the overall policy and management of science and technology within Government and with co-ordination of research programmes; and in future will consider departmental programmes within the context of the overall priorities identified by Ministers on the advice of ACOST.

10. The Science and Technology Assessment Office, whose formation the Committee welcomed (7.19), will provide assistance with this work. Its role is to encourage Departments, the Research Councils and the University Grants Committee (UGC) to devote more effort to assessing their R & D expenditures and evaluating their results. This is intended to help those who are responsible for spending public money on R & D to establish clearer objectives for future expenditure and develop and improve the criteria against which new and on-going projects are assessed and managed. A further important function will be to ensure that all bodies involved in public R & D have regard to the economic impact and commercial exploitation of the work supported as well as its national benefit. Through direct participation in this work, the Assessment Office will be expected to build up a picture of the relative contribution of

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the different R & D expenditures to the United Kingdom's competitive position and will be responsible for contributing advice on these matters to the new, strengthened central structure.

11. The Committee recommend that approximately 1% of all Government R & D expenditure should be devoted to evaluation (7.20). It is difficult to say what is the right percentage of Government R & D expenditure to devote to this. It depends in part on how much of the administrative and decision making process is treated as "evaluation". The Science and Technology Assessment Office will be identifying and encouraging best practice amongst Departments in regard to procedures and will be considering how much effort should be put into the various stages of the assessment process.

RESEARCH COUNCILS AND HIGHER EDUCATION

12. The Government welcome the main thrust of the Select Committee's recommendations for increased harmonisation of Research Council procedures (7.7); strong management and clear decisions about priorities between Research Councils (7.8); evolutionary progress, possibly leading to eventual unification of the Research Councils (7.9); fostering further collaboration between higher education institutions and industry (7.30); the UGC selectivity exercise (7.31); and closer links between Government research establishments and Research Council institutes and higher education institutes (7.33). As a nation the United Kingdom can no longer afford to engage in world class science in all subjects in all universities. The cost of research - particularly the capital cost - inevitably increases while the scientific opportunities expand at a growing rate. At any realistic level of resources selectivity is essential.

13. Individually the Research Councils have made progress in the identification of priorities and more active management of resources, including substantial restructuring in some cases, which they describe in the corporate plans they now publish. The UGC has embarked on a policy of selectivity of research funding in universities; and this will be taken further by the changes to be introduced following the Government's acceptance of the main thrust of Lord Croham's Report on the UGC (announced in the White Paper on Higher

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Education, Cm 114). Many universities have set up Research Committees, as recommended by the Merrison Report on the Support of University Scientific Research (1982, Cmnd 8567).

14. The Advisory Board for the Research Councils (ABRC) have set out their plans for implementing greater concentration of research resources in their Strategy document, "A Strategy for the Science Base". These include a recognition that spending on "big science", particularly particle physics and astronomy, must decline further in real terms; and plans to introduce an inter-disciplinary approach to Research Council funding and management of research in higher education institutions. As a first step in this approach, a number of multi-disciplinary university research centres will be set up, funded and managed by the Research Councils, with the involvement of industry, [and in some cases the involvement of more than one university or polytechnic in a particular area].

15. Implementation of these plans across the whole of the higher education and Research Council system will require, as the Select Committee observes (para 6.45), "strong management and clear decisions about priorities"; a more effective ABRC; and a closer coupling between the selectivity processes of UGC and ABRC. The ABRC recognise this in their Strategy document which calls for "concerted action involving both sides of the dual support system". Government proposals for the future of the science base and associated advanced training will be the subject of a white/green paper to be published later in the year. This will also address other important issues raised by the Select Committee on the role for polytechnics in research (7.32) and the output of engineers (7.35).

16. The Select Committee recommended that the research fund established by the National Advisory Body for Public Sector Higher Education (NAB) should be increased (7.32). The Government have agreed that the NAB research initiative, introduced in 1985-86, should be repeated and expanded [under the auspices of the Polytechnics and Colleges Funding Council.] In 1985-86 £2.5 million per annum was made available over a three year period allocated over 21 institutions. For 1987-88 £3.8 million has been made available, initially for

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one year only but with the expectation of being continued for the following two years. The funding is for activities of demonstrated quality in institutions which have proven track records of successful industrial and commercial involvement.

17. The Select Committee recommend that Government Departments should adopt forthwith the UGC guidelines on overhead payments in research contracts with universities (7.34). The last time the UGC issued guidelines was in 1970 and 1971 when they suggested universities should consider whether the cost charged for research contracts should be the full economic cost or some higher or lower figure. The UGC suggested that 40 per cent of total direct costs would be a useful starting point for overheads on relatively small projects. Since then the Committee of Vice Chancellors and Principals has endorsed proposals from a Working Party of the University Directors of Industrial Liaison. The present position of the Government, who are currently considering the Working Party's proposals [to be resolved before publication?] is:

"Institutions should not subsidise the clients (including Government Departments and agencies) for whom they carry out research and consultancy. Clients should normally pay not only the direct costs involved, but also an appropriate share of general overheads; any exceptions should be made consciously and only in accordance with explicit institutional policy" (1985 green paper 'The Development of Higher Education into the 1990s', Cmnd 9524, paragraph 5.14).

METHODS OF FUNDING RESEARCH

18. The Government welcome the Select Committee's support for the concept of the Science Budget (7.10); and the devotion of part of that budget to strategic areas of research offering some prospect of economic benefit (7.11). The Science Budget already makes a significant and increasing contribution to the nation's prosperity. This will be further increased through the measures described above. The white/green paper on the science base and associated advanced training will develop these themes while recognising the need to maintain the right balance between research pursued for reasons of intellectual

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curiosity and economic benefit.

19. The Select Committee recommend that the costs of superannuation, restructuring and international subscriptions should be separately itemised in the Science Budget and any significant increases met in full (7.12). These costs can be identified, and indeed the advice of ABRC to the Secretary of State for Education and Science goes a good way towards doing this publicly. The management of all these costs will be addressed in the white/green paper.

20. The Select Committee's endorsement of the customer/contractor principle for R & D funded by Government Departments is welcomed; the Government recognise the need for Departments to have adequate scientific strength for the conduct of informed dialogue with research contractors (7.13). Departments have evolved different arrangements with their research contractors in response to the Rothschild recommendation for a 10 per cent surcharge to be added to all Government contracts for commissioned research (7.14).

21. The Government welcome the Select Committee's support for strategic research in particular that which is of most significance to the United Kingdom's economic future (7.15 and 7.16); and for the 'exploitable areas of science' process (7.17 and 7.18). The importance with which the Government regard strategic research for both economic and social objectives is indicated by the fact that departmental and Research Council spending on strategic civil research was £488 million in 1984/85, nearly a quarter of total Government spending on civil research and development. The LINK programme, which was launched last December, has as a specific aim the fostering of strategic areas of scientific research directed towards the development of innovative products, processes and services by industry. Through LINK the Government will support - with expenditure reaching £210 million over the next five years - up to half the cost of collaborative programmes between the scientific community and industry and, in many cases, Government research establishments. ACARD has identified the need for a central and permanent forum to identify promising new areas of science and technology - 'exploitable areas of science' - for exploitation by industry. The Centre for Exploitation of Science and Technology (CEST) is therefore being established, essentially with support from industry

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and commerce but with some initial financial contribution from Government. [To be updated as agreement reached on setting up CEST. Expect to be able to announce the agreement of initial funding from industry and commerce, with some contribution from Government.]

INDUSTRIAL R & D

22. The Government share the Select Committee's concern that, in general, the level of R & D being funded and performed by British industry is inadequate and agree that the main responsibility for funding "D" should properly rest with industry (7.21). The Government's primary objective is to provide the right climate to enable industry to compete effectively and to generate the resources necessary to support R & D. The devising and financing of industry's R & D and innovation programmes must largely be for industry itself since these are commercial decisions which should primarily be governed by market forces. There are, however, circumstances in which public support for R & D is justified, for example, where projects, though economically attractive, are too risky for firms to go ahead alone because of long timescales, high technical or other risks; where potential beneficiaries of the R & D, including customers, are too diffuse for a company to fund R & D unaided; and to secure a United Kingdom presence in certain key technologies or markets. The Government already provide funding across a wide range of activities, the LINK programme being the most recent. The prime need is, however, for industry to increase the level of R & D it funds; less than 59 per cent of R & D expenditure by industry in 1985 was funded from industry's own resources in the UK compared with 67 per cent in USA, 72 per cent in France (in 1984), 76 per cent in Italy, 82 per cent in West Germany and 98 per cent in Japan (in 1984). Because of the fundamental importance of industrial R & D to the growth of the economy and of the need to achieve a substantial improvement in the R & D performance of industry the Government are preparing a green paper on industrial sponsorship and R & D for publication later in the year. This green paper will address both the industrial sponsorship role of the Department of Trade and Industry (DTI) and the stimulation of private sector R & D. On the former the Government note the Select Committee's recommendation for an increase in the total amount and coverage of DTI support for industry (7.23).

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23. The Government accept the Select Committee's view that there is a need to emphasise to shareholders and managers the value of R & D (7.22) and have consistently done this in a number of ways, including the retention of the Scientific Research Allowance (when other capital allowances against corporation tax were withdrawn) and the inclusion of R & D as a qualifying activity for the Business Expansion Scheme. It is for companies though to ensure that their bankers and major shareholders understand the need for investment in R & D - an understanding which will be assisted by the reporting of R & D expenditure in annual accounts. The Government welcome the decision by the Accounting Standards Committee to publish as an exposure draft the revised Statement of Standard Accounting Practice (SSAP) 13 which would require companies to disclose in their annual statements the amounts they spend on research and development. Assuming that this leads to the adoption by the accountancy institutions of an SSAP substantially along the lines of the present draft, the Select Committee's objective (7.25) will have been effectively achieved without the need for legislation.

24. The Government agree with the Select Committee that it would be desirable to develop the statistical information available on private R & D to the standard of that on public R & D (7.28) and have already announced that from 1986 onwards sample surveys of private industry will be conducted annually with benchmark enquiries taken every four years. Information on industrial R & D and Government funded R & D will both then be available on an annual basis.

25. As the Select Committee recommend the Government have examined tax incentives for R & D expenditure (7.24). [This examination which considered the taxation arrangements in ten developed countries showed that there is no case for changing the current basis of tax incentives in the United Kingdom. Inland Revenue to provide additional wording. Treasury yet to decide whether to make public the existence of this study and its findings.]

26. The Government agree with the Select Committee on the importance of public purchasing and the contribution it can make to stimulating R & D in the private sector (7.26). Since the introduction of the Public Purchasing Initiative in

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1980 it has always been the Government's policy that public purchasers should use their influence to help improve the competitiveness of their suppliers and thus contribute to a healthy industrial base and in particular to encourage innovation. Public purchasers are already being urged by the Government to make suppliers aware of their willingness to buy "first-off" products when these will ensure value for money in the longer term. In addition the Public Purchasing Guidelines, which the Government issue to all public bodies, have recently been revised to request purchasers to indicate to their suppliers that the extent of own-funded R & D is an additional factor which will be taken into account in assessing company strength.

27. The Select Committee urge the Government to expand their present effort in aiding the inward flow of technology (7.27). In addition to their Overseas Technical Information Service, DTI introduced in 1986 the Overseas S & T Expert Mission Scheme to transfer industrially relevant science and technology information into the United Kingdom. Other improvements in this area include: S & T Counsellors, based in London but responsible for identifying technological opportunities in several countries; the Visiting Engineers' Scheme for secondments to Japan; and expansion of the TechAlert and EuroTechAlert schemes. The growing number of international collaborative projects which the Government strongly encourage and, as appropriate, support financially will play an increasingly important role in aiding the inward flow of technology.

28. The Select Committee recommend that the Government should do more to meet the R & D needs of small firms (7.29). DTI have taken a number of specific measures to help small firms, through: the Support for Innovation programme; subsidised Business and Technical Consultancy; the Small Firms Merit Award for Research and Technology; and information on international activities. The Ministry of Defence have recently announced their plans to help small firms, including their Small Firms Research Initiative. [E(RD)(0) examining schemes for supporting R & D manpower in small and medium sized enterprises.]

INTERNATIONAL COLLABORATION

29. The Government welcome the Select Committee's support for international

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collaboration in R & D (7.36). Research has become increasingly international: the increasing expense of scientific installations means that certain types of research can only proceed when costs are shared; a number of scientific problems show no respect for national frontiers, for example, in areas of human health and environmental pollution; and common research can help towards the unification of the European market in areas such as information technology and telecommunications which might otherwise be dominated by our trading competitors. The Government have already played an important role in encouraging European collaboration, for example, through industry led joint R & D under EUREKA, and the European Community (EC) industrial programmes [to be redrafted when EC Framework Programme agreed.] The Select Committee raised three points on the Treasury rules relating to EC R & D funding, while accepting the principles lying behind these rules (7.36). The new central structure machinery outlined above will address the role of the United Kingdom in international collaboration in science and technology, and in this context will be able to consider whether there is a case for amending or clarifying these rules.

CIVIL IMPLICATIONS OF DEFENCE R & D

30. The civil and defence R & D budgets are already recorded separately, as the Select Committee recommends, in the Annual Review of Government Funded R & D (7.37). The Government agree that their size should be determined by the civil and defence programmes which they support and by the nature and objectives of those programmes (7.37). The Select Committee recommend a thorough examination of defence R & D expenditure (7.37). ACARD have already embarked on such a study with particular emphasis on increasing industrial benefits from this expenditure. The new central structure machinery will keep under regular consideration science and technology priorities for both civil and defence R & D. [To refer to decision to reduce defence R & D drawing on the text to appear in the Statement on the Defence Estimates.]

31. Efforts to increase spin-off from defence R & D are an important objective for the Government (7.38). While the primary role of defence R & D is to support the procurement of equipment for the Armed Forces, it also makes an

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important contribution to the broader national economy to the extent that work is conducted for civil customers or for exports; technologies are developed with civil as well as defence applications; enabling technology work is contracted out to industry; jointly-resourced research programmes are undertaken with DTI and industry; research grants are financed jointly with the Research Councils; and science parks can be developed adjacent to research establishments. Defence Technology Enterprises Ltd (DTE) has rapidly established itself as an effective channel between the work of Ministry of Defence (MOD) scientists and engineers and civil industry; after its first full year of activity, DTE now has some 450 items of exploitable technology on its database.

32. The Government accept the need to keep security constraints on technology transfer from defence to civil applications to the minimum necessary to protect vital defence interests (7.39). In practice it is often possible to draw a distinction between dissemination of technology (which can usually be permitted) and weapons and equipment applications of technology where more restrictions apply. The Select Committee recommended the publication of a more detailed annual report on the results of defence R & D (7.39). The MOD are planning to produce a separate annual report, in addition to the Statement of the Defence Estimates, in the form of an information brochure on the defence research programme.

CONCLUSION

33. The Select Committee have recommended a high profile for science and technology, dynamic leadership at the centre, and a new approach to funding R & D (7.40). The Government are confident that the strengthened central structure arrangements set out in this response will achieve the Committee's first two objectives. On the new approach to funding R & D, the Government already have means of funding strategic research; they hope that industry will contribute to the new Centre for Exploitation of Science and Technology. CEST will provide guidance on exploitable areas of R & D which industry and Government can combine in funding. In addition the Government are planning further developments in the fundamentally important areas of the science base and

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associated advanced training, and industrial sponsorship and R & D, which will be described in two green papers [one white, one green?] later in the year. Together these major initiatives will stimulate the culture change which is required in industry, science and technology for success in the 1990s.

cc BG



nbpm

Treasury Chambers, Parliament Street, SW1P 3AG

The Rt Hon Kenneth Baker MP
 Secretary of State for Education and Science
 Department of Education and Science
 Elizabeth House
 York Road
 London
 SE1 7PH

16 April 1987

Dear Secretary of State,

CERN REVIEW

Thank you for sending me a copy of your minute of ^{at flap} 6 April to the Prime Minister. I have also seen her Private Secretary's minute to yours of 9 April.

I recall from the attachment to your previous minute on this subject, of 25 November 1986, that a very substantial interim report is expected from Professor Abragam in June, and that it should be possible to gauge from it whether the review would produce satisfactory results. I hope that it will be possible for concrete decisions to be taken quickly thereafter, so that they can be included in our discussions in the Survey. That does of course underline the need to avoid any further slippage in the review timetable.

I am copying this letter to members of E(A), to Sir Robert Armstrong and John Fairclough.

Yours sincerely

John MacGregor

PP JOHN MacGREGOR

(Approved by the Chief Secretary and signed in his absence.)

SCIENCE + TECH: Budget PTS





10 DOWNING STREET
LONDON SW1A 2AA

From the Private Secretary

9 April 1987

C. DTI
CBL
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CERN

The Prime Minister has seen, and noted without comment, your Secretary of State's minute of 6 April about progress on the Abragam review.

I am copying this letter to the Private Secretaries to members of E(A), Trevor Woolley (Cabinet Office) and John Fairclough.

(ANDY BEARPARK)

R.L. Smith, Esq.,
Department of Education and Science.



PRIME MINISTER

CERN

You asked me to keep you informed about progress on the Abragam review by the end of March. I am sorry to be a little late but I was not satisfied with what I was initially told and wanted to look further into the matter personally.

I am absolutely clear that we must take a final decision this year about CERN. Professor Abragam's review is an important element in that decision; another is the damage that currency fluctuations do to the science base. But, as I see it, the central consideration should be our examination of the needs of the Science Budget in this year's Public Expenditure Survey; and whether there is a case for using savings from CERN to fund science of greater economic relevance in accordance with the public undertaking given by Keith Joseph. I am actively considering that now in preparing my PES proposals.

I am told that the review is probing deeply and asking the right questions aimed at reducing the overall budget, finding other sources of income and calculating members' subscription to take into account the advantages to the French and Swiss of being the home states. I share your concern at possible slippage in the timetable and this has been conveyed by Professor Mitchell to Professor Kummer the President of the CERN Council. I have asked George Walden to visit Professor Kummer to stress the urgency of the review, without prejudice to our subsequent freedom of action. I will keep a close eye on progress and will offer further advice later this year. I recognise the need to give you and our colleagues adequate time for considering the implications, should I advocate withdrawal.

I am copying this minute to members of E(A), Sir Robert Armstrong and Mr. John Fairclough.

KB

Department of Education and Science

6 April 1987

Prime Minister²



Copied to BG and
seen by DRN

ELIZABETH HOUSE
YORK ROAD
LONDON SE1 7PH
01-934 9000

Mike Eland Esq
Private Secretary to the
Lord President
68 Whitehall
London SW1

1 April 1987

Dear Mike,

HIGHER EDUCATION AND RESEARCH

I sent you yesterday a copy of the statement my Secretary of State intends to make this afternoon on higher education. I said I would be copying round this morning an additional short passage on research funding. This is attached and takes the form of an additional paragraph to go into the Statement after the existing paragraph 11. The paragraph has been cleared by the Chief Secretary. I would be grateful for any comments you may have by 12.30 pm today.

I am copying this to the Private Secretaries to the **Prime Minister**, the Lord Privy Seal, the Secretaries of State for Wales, Northern Ireland, Environment, Employment, Scotland and Trade and Industry, the Chief Secretary, the Chief Whip (House of Commons), ^{Chief} Whip (House of Lords), to Trevor Woolley and to Bernard Ingham.

Yours sincerely,
Rob Smith

R L SMITH
Private Secretary

H E WHITE PAPER STATEMENT

Draft Science Para

12. The White Paper rightly acknowledges that the quality of our research is recognised worldwide. The Government is committed to maintaining and enhancing the strength and quality of the science base, of which our institutions of higher education are a major and essential part. We attach particular importance to sustaining the work of the most able scientists and their teams. The Government is accordingly making available an additional £15M for 1987/88 through the Science Budget. This funding is in addition to the £39M increase in that Budget for 1987-88 which I announced on 6 November last year, and the extra £17.5M over three years for AIDS research by the MRC announced since November. The consequences of the increase I am announcing today for later years will be taken into account when we consider the Science Budget in this year's Public Expenditure Survey. But I emphasise that we, and the scientific community, face difficult choices in the future. We must be more selective. We must concentrate resources. We must get even better value for money from better targeted research. We must exploit our science to the utmost - and that is a matter as much for industry as for Government, the Research Councils and higher education.



PRIVY COUNCIL OFFICE
WHITEHALL, LONDON SW1A 2AT

1 April 1987

NRM.

Dear Rob,

The Lord President yesterday had several conversations with your Secretary of State and other Ministers concerned about the funding of research councils. This letter records the points made and the conclusions reached.

In putting the case to the Lord President for an immediate increase in funding, your Secretary of State said that as identified in his minute of 20 March to the Prime Minister he was coming under increasing pressure in both the media and Parliament to provide additional money to research councils. The Prime Minister had asked him to discuss these claims with the Chief Secretary. This he had done and he believed he was close to agreement with the Chief Secretary on an increase of £15 million for 1987-88 with some formula reference for subsequent years. He was due to make a statement on his higher education White Paper on Wednesday 1 April and he thought that there would be very considerable political advantages in announcing additional funding at that time. An increase of £15 million was less than the research councils were seeking and if made in a free-standing statement later in the month would attract greater criticism on that score. Moreover, there were signs that the Opposition were moving to exploit the issue. The Leader of the Opposition had written twice to the Prime Minister; they had a supply day debate on Monday of the following week and if they chose science funding as a subject then the Government would be forced on to the defensive.

The Chief Whip subsequently advised that the choice of science funding for the supply day topic would be a sensible choice for the Opposition all the more so in that few, if any, Government backbenchers would support the Government while those under pressure in their constituencies would be critical.

The Chief Secretary, Treasury confirmed that he saw the force of the arguments the Education Secretary had put and that he was inclined to agree to an increase in funding.

Rob Smith Esq
Private Secretary to the Secretary of State
Department of Education and Science

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However, in view of his wish to see research and development priorities assessed together and the arrangement for E(A) to consider space funding in the following week, his preference was to defer a final decision until the two matters and the associated decision on European research could be taken together. He quite appreciated, however, the attractions of an early announcement in the context of the Higher Education White Paper and would accept colleagues' judgement on where the balance of advantage lay.

The Trade and Industry Secretary said that he too would much prefer the decision to be taken in the following week alongside that on space funding but if colleagues thought the presentational advantages of an early decision and announcement on research funding sufficiently strong he was prepared not to press this.

The Lord President, concluding these discussions, said that while his preference too would have been for the decision to have been taken alongside other funding decisions in the following week, he was sufficiently persuaded of the risks of the Government being wrong-footed by the Opposition using their supply day, to agree to an increase being announced in the statement being made on Wednesday 1 April. The text of this statement should be cleared with the Chief Secretary and other colleagues most concerned. In reaching this decision, he had explored the possibility of deferring altogether the statement on the Higher Education White Paper but shared the general view of colleagues that this would be politically unattractive.

I am sending a copy of this letter to David Norgrove (No 10), Jill Rutter (Chief Secretary's office), Timothy Walker (Trade and Industry Secretary's office), Murdo Maclean (Chief Whip, Commons' office) and Mr Unwin in the Cabinet Office.

yours sincerely,
Mike Eland

M J ELAND
Private Secretary

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10 DOWNING STREET
LONDON SW1A 2AA

From the Private Secretary

MR FAIRCLOUGH

SCIENCE AND TECHNOLOGY

Thank you for your minute and paper of 27 March. I shall arrange a meeting for around the end of the month.

The Treasury will I suspect fiercely resist your model A. They will dislike in principle the ring fencing of an area of spending. They will fear that in July colleagues will be happy to increase spending on science and technology because they will not see it as threatening their own bids. The Treasury may also argue that an increase could jeopardise a conclusion at the July spending Cabinet to stick to the existing planning totals, encourage colleagues to believe that extra resources were available, and increase the difficulty of the autumn discussions.

And they may be right. The new arrangements would tend at least to protect spending on science and technology.

Against this background, the Prime Minister will however wish to consider very carefully whether she should chair the committee. She will I think be reluctant to be put in a position where she might be expected to decide to increase public spending at the beginning of a PES round against the views of her Chancellor and Chief Secretary.

Whether this is the case or not, your note should perhaps recognise both in model A and model B that a committee chaired by the Prime Minister would in practice tend to take final decisions. There is in reality little question of E(ST) offering "views" to the Treasury ((iv) of model B).

I am copying this minute to Sir Robert Armstrong and to Mr Unwin (Cabinet Office).

DNW

David Norgrove
1 April 1987

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PRIME MINISTER

RESEARCH COUNCILS

The Lord President decided in your absence that Mr. Baker should be allowed to announce £15 million extra for the Research Councils in 1987/88. He was anxious that you should know the background to this decision which was taken following a meeting with Mr. Baker and the Chief Secretary. (I was present.)

Mr. Baker argued that if extra money was to be given it should be announced as part of his statement today (Wednesday) about the publication of the White Paper on higher education: if the increase were announced on its own it would be severely attacked and would be seen as an inadequate response to the problem. (The Research Councils claimed that £22 million was needed to compensate them for the effects of the various pay settlements.) A further consideration was a feeling that the Opposition might well choose science or R&D for their Supply Day this coming Monday. If they were to do so and no extra money was announced, the Chief Whip believed there would be very few Conservative backbenchers to speak in support of the Government.

Against this it was argued that E(A) is scheduled on Monday to discuss expenditure on space and possibly also the European framework for R&D. A decision this week to increase funding for Research Councils could tend to pre-empt that discussion and might be seen as rather a snub to Paul Channon.

Following the meeting, the Lord President spoke to Paul Channon, and decided, though very reluctantly, that the announcement should be made today. He felt on balance that extra money for the Councils was likely to be given sooner or later and that there could well be substantial political costs to the Government from the delay. (Among other things he feared that Mr. Baker might not put his back into defending the Government's position over the next few days if his

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- 2 -

proposal were rejected.) The possibility of postponing the White Paper was seen as unattractive.

The Lord President was throughout very concerned that his decision would reduce your room for manoeuvre at E(A) on Monday and he took it with great reluctance. I think it would help if I could tell his office on your behalf that you understand and agree with the way he handled this. Agree?

DR

Yes

DAVID NORGROVE

1 April 1987

VC4AMT

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~~CCBG~~

DN/aw.

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MR NORGROVE - No. 10 Downing Street

27 March 1987

SCIENCE & TECHNOLOGY

Thank you very much for your helpful comments in the minute of 12 March recording my discussion with the Prime Minister. I am attaching for your information a copy of our latest thinking on the machinery which would support a Cabinet committee focussed on Science and Technology Policy. When I prepared this minute I had in mind an early follow-up to the Prime Minister. I met with Sir Robert Armstrong yesterday to seek his advice. Sir Robert suggested, and I agreed, that it would be more effective to include the proposed changes in the machinery in the context of a draft of the White Paper we are planning in response to the House of Lords Select Committee report on Research and Development.

2. Sir Robert supports the proposal and in particular Model A in connection with budgetary planning and, secondly, that the Prime Minister should chair the Science and Technology committee.

3. I expect to be able to have a draft of the White Paper, together with a paper describing the proposed machinery, ready for the Prime Minister's review during the week of 20 April.

4. Again, thank you for your help and support.

JOHN W FAIRCLOUGH

Chief Scientific Adviser

att

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GOVERNMENT R & D EXPENDITURE: A POSSIBLE NEW CENTRAL STRUCTURE

1. This note outlines revised functions for:-

- a Ministerial Committee with responsibility for setting priorities for Government expenditure on science and technology
- an independent body which offers advice to the Committee on R & D priorities.

It also discusses the linkages between the Ministerial Committee and the Public Expenditure Survey and the respective responsibilities of the Committee and Departments in managing science and technology expenditure.

New Proposed Ministerial Committee - E(ST)

2. The existing terms of reference of E(RD) are at Annex A.

3. The weaknesses in the current arrangements are that whilst E(RD) is required to develop R & D policies, it has no power to decide over their resourcing or implementation. By concentrating on the economic contribution of R & D it also has a less well defined role in relation to basic science, R & D undertaken for 'public good' reasons and technology transfer activities (expenditure on which falls outside the definition of R & D).

4. The proposed terms of reference of a new Ministerial Committee might be:-

- a) to develop national priorities for S & T (ie R & D plus technology transfer);
- b) to keep Departmental science and technology programmes under review and to approve their objectives consistent with the national priorities;
- c) to advise on the disposition of available resources for science and

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technology expenditure between Departments (see below para 6);

- d) to establish from Departments' forward provision for science and technology an uncommitted wedge to be disposed each year for new high priority programmes;
- e) to be responsible for considering all issues in which science and technology is the dominant consideration and for which collective Ministerial decision is required.

Title and chairmanship

5. To indicate its broader remit E(RD) should be renamed E(ST). With its power to establish priorities and to approve or disapprove the objectives of Departmental programmes, it should not be chaired by a Minister from a spending Department but by the Prime Minister or the Lord President.

Linkages with the Public Expenditure Survey

6. The Prime Minister wants a decision making process for science and technology which goes well beyond E(RD)'s existing terms of reference. At the same time the total amount of Government money to be devoted to R & D must be taken within the context of the Public Expenditure Survey. The following two models suggest different ways in which E(ST) would have an influence, though not power of decision, over the total amount of Government funded R & D and a greater say over the allocations to individual Departments.

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Model A

- i) provision for science and technology is settled in parallel with the PES process by E(ST);
- ii) each July E(ST) obtains provisional authority from Cabinet for a fixed total provision for science and technology spend for the PES years. It then allocates the amounts amongst Departments on the basis of the detailed scrutiny of plans and programmes it has undertaken during the previous months and the outside advice it has received on priorities;
- iii) in September the Treasury ensures that decisions on Departmental provision for non science and technology items are consistent with E(ST)'s allocations for science and technology;
- iv) final decisions on outstanding items are taken by the Star Chamber and Cabinet;
- v) following the Autumn Statement E(ST) begins a new scrutiny of Departmental plans and programmes, concentrating on the period ahead of the following financial year;
- vi) for these years, E(ST) requires all Departments to retain a small but rising uncommitted margin. This serves as a flexibility margin against which Departments bid;
- vii) Departments do not submit independent PES bids for science and technology. The total level of resources available is settled globally between E(ST) and the Cabinet;

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viii) Departmental allocations for science and technology remain earmarked subject to some agreement on transfer to or from non science and technology programmes.

Model B

- i) as with Model A, E(ST) scrutinises Departmental programmes after each PES round. It holds a flexibility margin and decides on its allocation between Departments before the start of the next PES round;
- ii) these reallocations are reported to the Treasury and consequential adjustments made to Departmental baselines;
- iii) Departments are free to bid for additional provision for science and technology in the PES round;
- iv) E(ST) offers views to the Treasury on the merits of individual bids and on the desirable overall level of science and technology provision but final decisions are taken as part of the overall PES process.

Official Committees

7. At present there are three active official committees dealing with S & T policy - E(RD)O, ST0(CS) and ST0(IA) (International Affairs). These could be rationalised into a single committee E(ST)O, although a sub-group might be established to deal with international affairs. If the E(ST) committee dealt with all issues of predominantly science and technology concern, E(ST)O would similarly bring together responsibilities which are at present somewhat fragmented between official committees.

Advisory Structure

8. An expanded role for ACARD would be required to match the functions of

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E(ST). In addition to its present functions, it should have an advisory role in respect of academic science as far as the broad allocations and emphasis are concerned. This would lead the ABRC towards the executive function which the House of Lords recommends. To reflect the enlargement of its role, ACARD might be renamed Advisory Council on Science and Technology (ACOST). Second, its distinctive role should be to make recommendations on S & T priorities in the light of its independent assessment of UK industrial strengths, economic needs and scientific opportunities.

9. ACOST should report formally to the Prime Minister, as ACARD does at present. The primary location for considering its advice should however be E(ST).

10. There are a number of Advisory Bodies advising Departments on their own R & D priorities. There is probably still a good case for individual Departments to retain these bodies. E(ST) should however review the terms of reference of these bodies and ensure they link across satisfactorily to the work of ACOST.

How would the Ministerial and official committees determine national priorities? What programme of work would they undertake to this end?

11. E(RD) has concentrated on vertical examinations of Departmental R & D programmes. The approach which the new E(ST) might adopt is to consider priorities against the background of existing expenditure within the following three main categories and the need to ensure consistency and complementarity in the direction of the effort in each area:-

- a) curiosity driven science;
- b) applied research undertaken to support Departmental policy or procurement responsibilities, including statutory and regulatory duties concerned with consumer safety etc;

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- c) R & D undertaken on behalf of or in support of industry to remedy market imperfections, including technology transfer activities.

The new Committee should establish a programme of work for E(ST)O to undertake and commission advice from ACOST on issues which cut across Departmental programmes and follow the three broader classifications above.

12. A more selective approach is needed to curiosity driven science including work on enabling technologies which is undertaken by the MOD and the civil Departments as well as in the Universities and the Research Councils' Institutes. The challenge is to identify areas of science that lead to technologies which can be applied in support of Departments' policy and procurement objectives and will also underpin the applied research and development industry undertakes. Following the ACARD study on 'Exploitable Areas of Science' industry is being invited to set up and finance a Centre for Exploitation of Science and Technology which would attempt the sort of technology forecasting undertaken in other countries. This work should be highly relevant to the setting of national science and technology priorities by Government.

13. In the applied research field, the Committee should look at the overlap in terms of the underlying science and technology in programmes undertaken by different Departments. For example much of the Government's work involves chemical analysis. The techniques and the equipment required for this could often be shared. More importantly no coordinated view is taken of the benefits of undertaking scientific work to support these fragmented activities.

14. The Committee should establish a uniform rationale for public funding of R & D which is in response to imperfections in commercial markets so that the allocation of resources for this kind of activity is undertaken on a more rational basis. The Committee should also consider policies for addressing these imperfections by setting up arrangements for technology transfer rather than by supporting the R & D itself.

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15. It should not be imagined that it will be easy to set national priorities for science and technology, whatever the arrangements. Difficult judgements will have to be made. It is important the Committee should have the best information and advice available to help form these judgements; hence the importance of an effective ACOST. It will also need the necessary authority to cut through the arguments of those who will be encouraged to defend their Departmental interests by the absence of irrefutable evidence on the likely costs and benefits of different forms of science and technology spending; hence the need for an independent Chairman of the Ministerial Committee.



Ind. Policy

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bc BG

10 DOWNING STREET
LONDON SW1A 2AA

From the Private Secretary

23 March 1987

Dear Bob,

**PAY SETTLEMENTS: 1987/88 CONSEQUENCES
FOR THE RESEARCH COUNCILS**

The Prime Minister has seen your Secretary of State's minute of 20 March about the position of the Research Councils following recent pay settlements. She has commented that if your Secretary of State wishes to propose extra resources for the Research Councils, he must of course discuss this with the Chief Secretary in the usual way.

I am sending copies of this letter to the Private Secretaries to the Chancellor of the Exchequer, the Lord President, the Foreign and Commonwealth Secretary, the Chancellor of the Duchy of Lancaster, the Chief Whip, and to Sir Robert Armstrong and the Chief Scientific Officer.

Jans,
David.

D R NORGROVE

R. L. Smith, Esq.
Department of Education and Science

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②AS

PRIME MINISTER

RESEARCH COUNCILS

Mr. Baker's minute below seeks a meeting with you about the position of the Research Councils. He has not discussed this with the Treasury.

Whatever the merits of his case, this is a nonsense. You should not be drawn into expenditure arguments until all else fails.

Agree to say that Mr. Baker appears to be proposing extra expenditure on the Research Councils and, if so, he should discuss it with the Chief Secretary in the usual way?

Yes no

DNS

DAVID NORGROVE

20 March 1987

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PRIME MINISTER

PAY SETTLEMENTS: 1987-88 CONSEQUENCES FOR THE RESEARCH COUNCILS

1. You will be aware of the public criticism now developing as the Research Councils reshape their plans for 1987-88 to absorb the consequences of recent pay restructuring settlements - for academic staff, for the scientific civil service, and for the administrative civil service. In last year's PES I judged that the Research Councils needed an extra £50M in 1987-88. In the event we provided £24M. £20M of this was simply absorbed in the extra exchange rate costs of the large international subscriptions. The balance was absorbed in helping to meet additional 1986 pay costs.
2. The Research Council proposals for dealing with these latest consequences are most discouraging. I have summarised the extra costs in the attached Table, with notes on the ways in which the Councils intend meeting them. All of the Councils will have to make major reductions in research grants to universities - of about 30% in the case of SERC and MRC. Many original and distinguished research proposals will be lost, perhaps abroad, with their proposers and research teams. Presentation apart, real damage will result, perhaps nullifying the benefits which the settlements were intended to secure.
3. I do not believe that the Councils are bluffing. I have spoken personally with the Chairmen of the SERC and the NERC; and we have probed possible alternative measures with each Council individually. All of the Councils are vigorously pursuing programmes of rationalisation and concentration. The MRC has closed 23 units over the past ten years to release resources for new higher priority medical work. The AFRC has restructured to reduce its 24 institutes to 8. It is reducing its staff by 30% (1800) between 1 April 1983 and 1 April 1987. So far there have been over 500 compulsory redundancies; more will be needed. NERC has reduced its staff by some 20% between 1981 and 1986. At the same time it is steadily increasing its earnings from the private sector. SERC is rationalising its observatories with the move from Herstmonseux to Cambridge. It has achieved a major increase in the priority given to strategic science and engineering aimed at benefiting the

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economy; and is planning to deploy further resources to play a major part in the Link programme. The ESRC is pursuing tough new policies on postgraduate training, blacklisting universities where necessary.

4. For 1987-88 I believe that the Councils are taking the only measures open to them. More redundancies is no answer; they cost more money in the first two or three years. Cuts beyond those planned already in capital or running costs will prevent researchers from doing productive work. They will also reduce Councils' ability to attract funding from the private sector. In other directions Councils are bound by contractual commitments.

5. These consequences will damage science and are already attracting a good deal of adverse criticism. The Times has been running a campaign for some weeks now urging us to spend significantly more on civil R and D; and it features prominently letters from scientists attacking the Government. Owen has made a speech on the brain drain. There is an Early Day Motion from some of our own backbenchers urging us to spend more on civil R and D. I have had strong representations from some colleagues in the marginal university seats. The Speaker has turned down two PQs so far, and I would expect the Opposition parties to take this up as an issue with which to embarrass the Government. Yesterday's letters from Kinnock and Bray, to which I am sending you separately draft replies, look to me like the opening shots.

6. All in all over the next few months we could be subjected to a rising campaign from an articulate lobby. We will almost certainly see examples held up of individual scientists, and possibly whole groups leaving for the US as a result of the cut-backs in spending. Such a campaign could become a considerable irritant particularly as we will not be able to find anybody in the scientific and university world to speak up for our cause. I see no way of avoiding significant adverse public comment short of making additional provision from the reserve for 1987-88. We can come to consequences for the later years in the course of this year's PES, when we shall face some major decisions including a decision on whether or not UK should remain in CERN. But that offers no help now. I believe there is an overriding political case for exceptional action to deal with the situation in 1987-88.

7. In the context of the civil service pay settlement Nigel recognised that such circumstances might arise in keeping open the possibility of re-opening our discussions

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to deal with "insurmountable problems". I believe that this is one; and should be grateful if I could discuss it with you.

8. I am copying this minute to Nigel Lawson, Willie Whitelaw, Geoffrey Howe, Norman Tebbit and John Wakeham; also to Sir Robert Armstrong and Mr Fairclough.

K.B.

K B
Department of Education and Science

20 March 1987

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Table:: Science Budget 1987-88 Consequences of pay settlements since the 1986 PES

Body	Estimated Cost, £M, in 1987-88	Consequences
SERC	9.92	Cancel Grant Round III - closing date 1 April for 1 October start. 500-600 grants will not now be made, out of a projected total of about 1800 for 1987-88
MRC	4.95*	(i) Cut new project grants by 30%; number of rejected alpha-graded proposals will rise from around 90 to over 200, out of a total of about 500-600 "alphas" and (ii) Cut 10-15 new programme grants; these are major longer-term investigations; current examples include intellectual development in the deaf, and genetic aspects of disease.
	*Assuming NHS 5% pay settlement	
NERC	1.73	Eliminate planned increase in special topic grants for university research; current examples of such topics are the North Sea water quality programme, and the environmental radioactivity programme. The October grant round will also be delayed for three months.
AFRC	2.45+	No capital building starts in 1987-88; cut building maintenance and equipment; cut 1987-88 research grant money for new awards from £900K to £500K, that is about 100 awards p.a. cut to 50-60.
Other (ESRC, Royal Society, Natural History Museum)	2.77	ESRC will cut 20 new project grants to universities; normally they award 150-200. Royal Society probably reduce Visiting Research Fellows from 20 to 12.
TOTAL	21.82	

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SCIENCE & TECH : Budget

Pt. 6



bc Mr Norgrove - No 10
Mr Monger
Dr Walker

1. AB to see
2. pa 16/3
COPY FILE

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P 02577


From: J B UNWIN
16 March 1987

MR FAIRCLOUGH

CERN

I have seen the latest papers on CERN, to which the Prime Minister referred in the discussion on Space last week.

2. You will recall that I expressed concern at the lack of progress in my minute to you of 28 November last. The then delay in producing the promised report quickly meant that we could not get out of CERN until January 1989 at the earliest.
3. The latest position seems to be that we are not even assured of a full report from Professor Abragam by the end of June, let alone any firm indication of the ultimate conclusions. The best we seem likely to get, if we keep up the pressure, is a "substantial interim report" in June.
4. I understand that Mr Baker might decide to recommend to the Prime Minister that we should withdraw from CERN from 1 January 1989 even if the review recommended the 20-25 per cent reduction that we initially proposed. In view of the very hard choices we are now having to face on the science budget and R&D generally, there seems much to be said for this. I am in no position to evaluate the CERN expenditure myself, but I note that there is widespread agreement in Whitehall among those better qualified to judge that our current contribution is not justified.
5. You will have your own views, but it seems to me that there is a strong case for urging Mr Baker to grasp the nettle now. If we delay until the summer or autumn, this could easily get lost again, and we could find ourselves losing yet another year.


J B UNWIN

Science & Tech: Budget 5.





10 DOWNING STREET
LONDON SW1A 2AA

From the Private Secretary

4 December 1986

Dec 66

CERN

BF//

The Prime Minister has seen your Secretary of State's minute of 25 November about the progress of the CERN review. She is very concerned indeed about the length of time this is taking. She would like everything possible to be done to speed the review up, and would like to see a further progress report no later than the end of March.

I am sending a copy of this letter to the Private Secretaries to the members of E(A), Sir Robert Armstrong and to John Fairclough (Cabinet Office).

Yours ever

Andy

(P.A. BEARPARK)

Rob Smith, Esq.,
Department of Education and Science.

OA

PRIME MINISTER

CERN

A progress report from the Secretary of State for Education on the CERN review is at Flag A; John Fairclough's comments are at Flag B.

The problem seems to be that the reviewers are taking their job very seriously, and are therefore taking a long time. The interim report is now due in June 1987 which means the earliest we could give notice to leave is end 1987 for an end 1988 departure. This is unfortunate, but there seems to be no reasonable alternative.

Mr. Baker's minute also mentions the problem of extra costs due to exchange rate changes. Treasury have advised that this is not a major problem - yet. They and DES are still discussing the question.

Content for me to reply, noting the delay with regret, and asking that everything possible be done to speed the report up?

(P.A. BEARPARK)
3 December 1986

The time taken is so long that we can only think the delay is deliberate. It is grossly inefficient.

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W0320

MR BEARPARK

From: J W Fairclough
1 December 1986

cc Mr Unwin

CERN

Mr Baker's minute of the 25th November reports that the CERN Review Committee under Professor Abraham, though soundly based, has not made the kind of progress that was anticipated when it was decided to seek an interim report, at this time, in order that Ministers could consider the merits of giving conditional notice of the UK's withdrawal from CERN by the end of 1986.

2. It is most regrettable that faster progress has not been made. This now means that, if we await the outcome of the review, we cannot withdraw from CERN - should we so decide - before January 1989 at the earliest. But I reluctantly conclude that, since the review which we inspired is now underway we could not without causing very great offence to our partners justify peremptory withdrawal at the present time. I therefore reluctantly see little alternative but to accept Mr Baker's recommendation.

3. However, it is most important to make absolutely certain now that the review is ready for consideration in June 1987, so that the government can consider the options on an informal basis then. The Prime Minister may therefore want to ask that every possible effort should be made to speed up the review, and to ask for a further progress report in the Spring (say, by the end of April).

4. I understand Treasury will advise you on the exchange rate issue. My understanding of the situation is that the additional funds made available to Mr Baker, in this PES round, took into account this problem.

JOHN W FAIRCLOUGH

JP

Jane Lane

SCI + TECH

BUDGET

ATS

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MR BEARPARK

From: J W Fairclough
1 December 1986

cc Mr Unwin

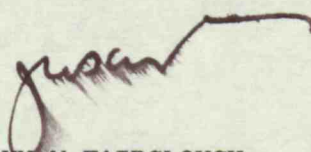
CERN

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JOHN W FAIRCLOUGH

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PTS

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Mr. Hargrove



(Personal)

await further comments

CABINET OFFICE

MS

Jaird,

Unless you have already responded, I

With the compliments of

suggest

you stay your hand until we have looked further at this.

28/xi

J. B. UNWIN

70 Whitehall, London SW1A 2AS

Telephone 01 233



CONFIDENTIAL

P 02381

From: J B UNWIN
28 November 1968

MR FAIRCLOUGH

cc Mr Wiggins
Dr Walker

CERN

Mr Baker's minute of 25 November to the Prime Minister reports that the review on CERN, though soundly based, has made little progress so far. He concludes that we should stick with it and that there are no grounds for proposing that the UK should decide to leave CERN now.

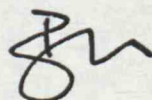
2. This effectively means that, even if we took such a decision when the report is available next June, we could not actually leave CERN until the end of 1988.

3. While this conclusion may be inescapable, I am a little worried about it in relation to the discussions in E(A) a year ago. The first issue for decision by Ministers then was whether we should give notice of withdrawal before the end of 1985, so that we could withdraw at the end of 1986. Ministers decided against this, but instructed DES Ministers to get on with persuading others to set up a sensible review, and the Prime Minister made it clear in subsequent correspondence that she wanted the option of withdrawing at the end of 1987 to be kept open.

4. Progress seems very slow, and, as above, the option of withdrawing at the end of 1987 now seems ruled out. In the meantime, the continued CERN funding requirements will add to the pressures on the Science Budget, including the new bid for some way of meeting the effects of exchange rate changes.

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5. Do you find Mr Baker's position acceptable? If not, we should so advise and possibly consider a further E(A) or smaller collective discussion before this year's options are finally closed. Mr Baker refers in his paragraph 5 to awaiting the advice of the ABRC on the use of the extra Science Budget money. Is this likely to be material to the CERN question? If so, we presumably ought to get it very quickly while this year's options are still open.



J B UNWIN

SCI + TECH - Science Budget, P.E.S



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A
CF
A
Per check if any accounts of BL
reported for Jh Fawcett & My link
AB

PRIME MINISTER

CERN

1. You asked for a report in November on the progress of the CERN review, as recorded in Mr Addison's letter of 3 March.

2. I attach a report from Professor Mitchell, the leading UK delegate to the CERN Council. Professor Mitchell has been keeping as closely in touch with the progress of the review as is consistent with its independence - a standing we emphasised in proposing it. He has indicated the importance that the UK attaches to keeping up momentum. !!

3. I see no grounds in Professor Mitchell's report for proposing that the UK should decide now to leave CERN. The reviewers are eminent, and are taking their task seriously. We instigated the review; we should not lightly abandon it. To do so would be seen as an act of bad faith.

4. Nevertheless, as you know, the question of an early UK withdrawal has been mooted in the SERC Council because of the additional costs that they now face - in all £20M in 1987/8 and £25M in each of the following two years of which about four-fifths is attributable to CERN - as a result of exchange rate changes over the last twelve months. The Council recognises that withdrawal from CERN would be a major blow to the science both of the UK and of the rest of Europe, and could have long term detrimental implications for international collaboration. The Council has come to contemplate it only because the additional costs threaten to overthrow their priorities by forcing disastrous reductions in research underpinning Link and similar programmes of economic significance.

5. The extra money allocated to the Science Budget in this year's PES, if applied to meeting the additional costs as a first priority, would cover next year's deficit and the greater part of that in the years following. I await the advice of the ABRC

on the use of the extra money. I know that they will be fully informed of SERC's position. If what they recommend and my proposed response bear on the CERN question I will, of course, consult you again before responding.

6. Even if the outcome is that we remain in CERN for now, we shall have to return to the question next year, on two counts. We shall need to reconsider our attitude to CERN in the light of the results of the Abragam review; and, even if that comes up to our best hopes, the experience of recent years shows that we must find a way of neutralising the effects of exchange rate changes on the inescapable international commitments of the Science Budget. I have therefore asked my officials to re-open discussions with the SERC and the Treasury on this aspect. Without some more satisfactory and enduring arrangements here our policy aims of sharpening priorities and increasing selectivity will be constantly at risk of being blown off course.

7. I am copying this minute and enclosures to the members of E(A), Sir Robert Armstrong and to Mr John Fairclough.

K.S.

KB

Department of Education and Science

25 November 1986

CERN REVIEW: A PROGRESS REPORT

Memorandum by the Chairman, SERC

1. This note reports progress made on the CERN Review, as at 31 October 1986.
2. At the instigation of the UK Government, the CERN Council agreed in February 1986 to undertake a Review of CERN with terms of reference as set out in Annex 1. The composition of the Review Panel was determined in April 1986 (Annex 2). The UK member of the Panel, Professor Fender, is currently a member of the Science and Engineering Research Council and Chairman of its Science Board.
3. The Chairman of the Review Panel, Professor Abragam, began his work immediately but the commitments of the other members meant that the Panel was unable to meet as a body until 8 September. It is now committed to meeting monthly. Professor Abragam has recruited an administrative assistant (Professor M Petiau, France) and appointed Dr C Llewellyn Smith as Scientific Adviser (he was also Scientific Adviser to the Kendrew Committee). The Panel has made good progress in analysing its remit, and each member of the Panel has agreed to take personal responsibility for specific tasks.
4. Professor Abragam has stated that he expects to produce a very substantial interim report in June 1987. The rate of progress of the Review is thus consistent with the UK's desire that it should be completed within a year. At present, the Panel's studies are at too early a stage for it to be possible to give any indication of the outcome of the Review. I have of course had several discussions on the conduct and progress of the Review with Professor Fender, and I have also had an opportunity for a substantial discussion with Abragam himself. I am impressed with the energetic, thorough and independent way that Abragam is organising the work of his Panel and I am confident that the "interim report" he intends to produce next June will provide sufficient indication of the Review's conclusions to allow the UK to reach decisions on its future attitude to CERN.

E W J MITCHELL
14 November 1986

CERN

Mr. John Mark Taylor asked the Secretary of State for Education and Science when he expects to announce a decision on the future level of British participation in CERN.

Mr. Walden [pursuant to his reply, 4 February 1986, c. 114]: On 20 February at the invitation of the Council of CERN I attended an extraordinary session at which it was unanimously agreed, following the proposal made by the United Kingdom, and on the basis of a resolution put forward by the President of the Council, Professor Kummer, to conduct a comprehensive independent review of the organisation. The resolution and accompanying explanatory note are as follows:

"CERN REVIEW

THE CERN COUNCIL

Recognising

the growing importance, for all European states regardless of their size, of political, economic, scientific and technological collaboration;

the necessity of fundamental scientific research of high quality both for the advancement of knowledge, and for future economic and social prosperity;

the success of the scientific collaboration in CERN which has given Europe a leading position in the world in the field of particle physics;

the growth of scientific opportunity in this and other fields, and the consequence for priorities both nationally and internationally;

the need for governments to review from time to time the distribution of financial and human resources over the existing scientific activities so as to ensure responsiveness to new scientific and technological developments;

the duty, with limited publicly-provided resources, of seeking improved cost-effectiveness and better value for money.

Having regard to

the desirability of maintaining also in the longer term the high quality and international character of CERN science and technology, and a programme in which LEP experiments as well as other ones, including smaller experiments, can find a place;

possibilities within the existing CERN Convention for engaging and enlarging other sources of funds and resources;

the possibilities for improved worldwide co-ordination of investment plans for accelerators and of their use;

the possibilities for improving efficiency within CERN and the need to match staffing cost-effectively to programme requirements;

the importance of realising LEP phase 1 and taking into consideration the completion of LEP to its full design energy.

Decides to appoint an ad hoc consultative group of external personalities to conduct an in depth comprehensive review of CERN with the following task:

to advise the Council how human and material resources, employment conditions, structure, operations and future use and development of facilities might be developed to operate with maximum cost effectiveness and value for money at alternative levels of funding by present Member States, and to assess their consequences for the CERN programmes and for the services to Member States*;

to assess the possibilities for engaging and enlarging other sources of funds and resources;

to report within one year findings and recommendations to the CERN Council and hence to the governments of the Member States.

Asks the Director-General of CERN and his staff, and other organs and committees of CERN, to provide such information and other collaboration as the Review Group may request.

*The Delegation of the United Kingdom requests the consideration of alternative levels of funding by present Member States ranging from constant contributions at 1986 levels to contributions reduced by 25 per cent expressed throughout in 1986 real terms, over the next 5-7 years. [The President undertook to ensure that the review group examined this option.]

Cern Review: Explanatory note

1. The Group should be composed of five to seven persons and might include scientists engineers and industrialists. Members should be chosen for their breadth of experience. One member would be named as Chairman. Chairman and other members should be ready to devote the appropriate time for this task. Chairman and members would be appointed by the President of Council on behalf of the CERN Council, taking into account proposals made by the Governments of Member States, and after consultation with Committee of Council.

2. The group would have its own full-time secretariat attached to the Chairman of the Group.

3. It would be for the group to decide on its procedures. The group would be free to examine any possibilities it chose. The Group should take account of the Scientific Policy Committee and of the progress of other relevant reviews such as CERN's own internal review programme including that of Professor Rubbia's group.

4. It would be open to the Group to commission further professional help (e.g. management consultant services) with the approval of the President of CERN Council.

5. The cost of the review will be evaluated and the manner in which it will be financed will be decided on the basis of a proposal made by the Chairman of the group in collaboration with the President of Council and of the Director-General of CERN."

High Energy Physics

Sir John Osborn asked the Secretary of State for Education and Science if he will make a statement on the progress being made by the Governments of the member countries of CERN to review expenditure on high energy physics following the meeting which he attended of CERN's council.

Mr. Walden [*pursuant to his reply*, 8 April 1986, c. 47.]: After the meeting of the CERN committee of council on 25 April, Professor Kummer, the president of council, announced that Professor A. Abragam would chair the review of the organisation, and issued the following statement.

"Professor, W. Kummer, President of CERN Council, is appointing on behalf of Council and after consultation with its Committee, which met on 25 April — seven European personalities to be members of the high — level group established by CERN Council last February for conducting an in-depth, comprehensive review of CERN. They are:

Professor A. Abragam (1914—France)
Nuclear and Solid State Physics
College de France. French Atomic Energy Commission.

Dr. M. Boyer (1939—Spain)
Economics and Physics
President of the 'Banco Exterior De Espana'

Dr. C. De Benedetti (1934—Italy)
Electrotechnical Engineer:
Managing Director of Olivetti.

Professor B. F. F. Fender (1934—UK)
Physical Chemistry:
Vice Chancellor of the University of Keele.

Professor W. Paul (1913—FRG)
Experimental Physics Bonn University

Mr. Haakon Sandvold (1921—Norway)
Engineer: Director of Ardal of Sunndal Verk A/S.

Professor J. Vodoz (1932—Switzerland)
Technical Sciences: President Amysa SA (Yverdon)
The Group is expected to start its work before this summer and to report to the CERN Council by June 1987."
This in-depth review was established following a UK initiative at a specially convened meeting of the CERN council in February and was reported to the House on 21 February at columns 355 and 356.

Scientists start to get streetwise

Lionel Milgrom discovers a novel experiment in the Northeast

Insulin was being developed, I was working as medical director to a company producing both human insulin and insulin prepared from pigs. Around 200 000 diabetic patients were receiving the insulin prepared from pigs, but it became obvious that, in the long term, all these patients would be transferred to human insulin. The company felt that the simplest, least confusing and most effective means of making the transfer was to announce that it was withdrawing the porcine insulin from the market and that it was replacing it with human insulin.

As far as the scientists were concerned, there were two problems in doing this. First, it was too early to know whether the treatments were truly equivalent. Secondly, the human insulin was about 10 per cent more expensive than its porcine equivalent. This would mean that the decision to change would be removed from the patient's doctor, and hospital pharmacy costs would increase. On the other hand, the company would recoup its investment more quickly.

The company concerned, to its credit, listened to its advisers eventually, although by the time the argument had been won within the company, the flak was flying in the real world. Questions were asked in the House of Commons on the proposed increase in the cost of insulin to the National Health Service, in relation to the clinical benefits.

The experience was enriching for all concerned, but we scientists had the true conflict because of our perceived rôles. Marketing people are employed to market, end of story. We were there to give scientific advice. It could have been argued that the question of cost was not part of our remit, and that the problem of bio-equivalence was potential rather than real. Indeed, it was argued thus for a time, and we were aware that our decision would cost the company money and might harm our employment prospects.

It is perhaps inappropriate that such important decisions should be taken by those enveloped in the fabric of an organisation, and perhaps scientific and medical advisers would be more objective if they were contracted to the company on a consultant basis rather than as full-time employees.

Anyway, the company concerned announced last month that it was replacing porcine insulin with its human equivalent next year. There is more experience with the preparations, and they are now the same price, but there may be a residual resistance to change from doctors.

At present, a doctor working for another drug company awaits proceedings in the high court relating to decisions made in the course of his full-time employment. It seems to me unfair to expect an employee to be objective, and to be held responsible, as if he were an independent professional adviser. Such a system will always produce anomalies and conflicts of interest.

Not only was I a full-time employee and adviser to an insulin manufacturer, but I saw my own brother injecting porcine insulin to control his diabetes. This may have involved me emotionally, but it also enabled me to see the effect of corporate decisions upon the end user.

"IF IT wasn't for that cathedral down there," remarked a fellow traveller, "Durham would be just another mining town." Looking down from the Intercity 125, as it glided in over the city's spectacular railway viaduct, I thought him less than generous. For apart from a controversial bishop, Durham also boasts a seat of learning. And although relatively small, Durham University could be about to bear witness to a resurrection of British science—with the help of industry and the spirit of the Jarrow crusade made flesh.

These days, it is almost fashionable for university dons to blame government, or erstwhile colleagues on research councils, for the lack of funds and low morale among Britain's academic researchers. Nothing is going to change, however, until researchers realise that their salvation must, to some extent, lie in their own hands. If the money won't come to the academic, then the academic must go to the money.

Some of Britain's best brains have already realised this and taken jobs abroad. But a potential solution lies closer to hand: money from industry. What worries academics is how they should set about getting that money, and what will be the cost in terms of academic freedom?

The answers to those questions could well lie in a novel experiment currently underway in the Northeast. It is called the University of Durham Industrial Research Laboratories, or UDIRL.

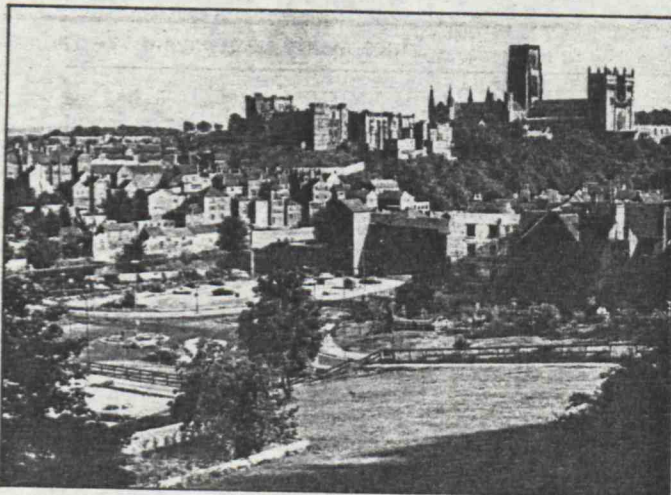
Housed on campus, in a brand-new propeller-shaped building called the Mountjoy Research Centre, UDIRL is acting as a focal point for industry and some of the university's scientists. Unlike a science park, however, Mountjoy has space not only for industrial firms, but for university researchers. The mix works to the benefit of both. Industry gets its problems solved, while the academics get funding, top-class equipment and business know-how. In the process, a new type of academic seems to be taking shape—one who knows both the value of his work and its price. Durham University is evolving Britain's first "streetwise" scientists.

The beginnings of UDIRL and Mountjoy can be traced in the development of Durham University over the past 40 years, and to the Jarrow march in 1936. After the march, an organisation called English Estates was set up by the government of the day in response to unemployment in the Northeast. Its task was to provide factories, warehouses and workshops, particularly in areas where private investors feared to tread. So successful has English Estates

been that it is now one of the country's leading high-tech property developers.

Meanwhile, since the end of the Second World War, Durham University had been emerging from its arts-based past and, by the 1960s and 1970s, was acquiring a scientific reputation, particularly in the field of materials science. In 1982, the university set up a Centre for Materials Science and Technology to put ad hoc contacts with industry on a firmer footing. It soon became obvious, however, that scientists with a biotechnological bent were also becoming interested in translating university science into industry. So, in 1985, in a new building owned by English Estates, biotechnology and materials science were combined in a single unit, UDIRL.

So what can UDIRL provide that more amateur university science departments



Wakeful spires: Durham could help resurrect British science

cannot? One answer is concentrated expertise. In Mountjoy, and the associated university science departments, there is an impressive list of modern, sophisticated spectroscopic equipment, dedicated to research on materials. This includes work in the "sunrise" areas of semiconductors and conducting polymers. And under the same roof, biotechnologists from the university are investigating bacterial fermentation with a view to producing xanthan polymers for use as food additives and to help extract oil.

But what use is all this amid the industrial decline that characterises much of the Northeast? A closer look reveals that new industries are growing up in place of the old ones. At Consett, for example, Whickham Engineering is pioneering ion-implantation techniques for manufacturing modified semiconductors that will eventually end up in microchips, solar cells and night-vision technology. UDIRL is helping to develop the machinery.

In biotechnology, new businesses dealing in biopolymers, enzymes and bio-processing are springing up all over the Northeast in places such as Stockton, Cramlington, Consett again, and Newcastle-upon-Tyne. This is alongside the more traditional pharmaceutical ▶

► endeavours of firms such as Glaxo, Searle, and Boots. UDIRL is ideally situated to lend technical support.

What's in it for the academics besides money? First, there is the equipment. Take UDIRL's NMR spectrometer. Bought and paid for jointly by the Science and Engineering Council, Varian (the makers) and firms that provide guaranteed business, UDIRL's spectrometer is the only machine of its kind in Europe. It is quite at home delving into the structures of polymers, pharmaceuticals, coal, zeolites, ceramics and proteins. Just the job for that large pharmaceutical or biotechnology company that does not have its own NMR expertise. Clients come from all over England and from Norway, Germany and Finland. At UDIRL, they'll run spectra and solve problems in around two weeks compared to the usual six. The academic who, in one moment, enthuses over his brilliant new toy, will, in the next, quote a cheap rate for

machine-time.

With all this contract work, is there time for pure research? Paradoxically, more than ever. Simply because the problems raised by industry touch on many, more fundamental areas. As Professor Robin Harris, head of Durham's chemistry department, says, "We have a chance to look into other people's problems that deepens our scientific awareness and allows us to get into more, significant sciences." And to ensure the greatest number of people are involved, staff at UDIRL move around between the Mountjoy centre and the university departments. This leads to greater intra- and inter-departmental awareness and connections.

There are few universities in Britain where chemists and physicists talk to each other, let alone work together! Fifty years after the Jarrow march, universities and industry would do well to turn to the Northeast for a little inspiration. □

for or against the British application?

(6) Is the government prepared to launch a campaign for true consumer protection, to cover potential Euro decisions in future on antibiotics, pesticides and the like? Has this been studied? By whom, and with what results?

THE PUBLIC inquiry at Thurso into a planning application to site a nuclear fuel reprocessing plant at Dounreay is nearing its 90th day. The proceedings are proving to be even more acrimonious than anticipated—and venom was indeed anticipated—by a row over the interpretation of statistics. The row centres on the emotive issue of "leukaemia clusters" (*New Scientist*, 9 October, p 14).

David Wilkie, chief statistical witness for the UK Atomic Energy Authority (UKAEA), maintains that the five cases of leukaemia recorded in the 0-24 age group between 1979 and 1984 are of no statistical significance. The cluster, which has been identified within an 8-mile radius of Dounreay, has occurred by chance, he claims.

In the other corner of this ring is Michael Heasman, recently retired chief statistics analyst for the Scottish health service. He tells the inquiry that the Dounreay cluster is 10 times greater than could have been expected, when compared with national averages, and that it is 1 in 5000 that it could have occurred by chance.

Wilkie maintains that clusters are random. He uses a table listing hits of German flying-bombs on London to show that they clustered in certain areas. Using a different analogy, he says that, although the frequency of football teams scoring three goals or more on a Saturday is low, it is rare for a footballing Saturday to occur without three or more goals being scored by one or more teams.

Wilkie says that Heasman's statistical conclusions are drawn from identifying the number of leukaemia cases in each of Scotland's 898 postcode sectors, which are then compared with the national average. He says the results would be vastly different if the figures were calculated from areas of equal population or over different time scales. The postcode area around Dounreay includes West Thurso, but says Wilkie, were the entire population of Thurso considered, the cluster would look significantly different and smaller.

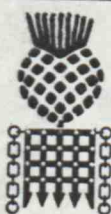
To support his ideas, Wilkie produces a tin of 350 white balls and 50 red ones, and demonstrates that, however often they are shaken up, there is always a cluster of the red balls. Readers of *New Scientist* may or may not be impressed by the UKAEA statisticians: I fear that, for the rest, they may well remain with their prejudices, one way or another. Fortunately for the UKAEA, the prejudices of the Caithness people are firmly on its side, because the UKAEA has been a unique provider of bread and butter. Any idea that suitable work, of a kind to provide the standard of life to which the people of that area have become accustomed, can be provided, other than via Dounreay, is moonshine.

THE POLITICAL progress of the new Swedish Secretary of State for Environment and Energy, Birgitta Dahl, is likely to be the cause of more than polite curiosity at

Farmers' beef and a nuclear pickle

More meaty issues from Westminster

THISTLE DIARY



Tam Dalyell MP

ANXIETY is growing in many quarters about the European Community's decision to ban the use of anabolic steroids in cattle, a ban which the government, after initial (and sensible) resistance, has now announced will also

be applied in Britain, from 1 December this year. No doubt, once the government of Eire decided to apply the ban, Britain was left out on a limb, with important meat exports at risk.

Nevertheless, it seems to many people, including MPs and Peers on both sides of the House, scientists, veterinary experts, some farmers and expert journalists and broadcasters, that the government's decision was hasty, ill-timed, inadequately considered and discussed, and totally at variance with the announced intention to challenge the European Community's ban on hormones in the European Court of Justice.

The anxieties are that a black-market situation will develop. Clearly, this would leave consumers baffled and bothered when shopping for meat. "Hormone-free" beef is already being offered by butchers: but no beef is "hormone-free"—the natural hormones exist anyway.

The danger, as I see it, is that unscrupulous dealers will sell cattle implanted with unused stocks of banned hormones, that the current inspection system will be totally inadequate to catch the cheats, and that, at the end of the day, consumers will be paying more for lean meat (which dieticians say is better, healthier, than fatter meat). Consumers will have no real protection. They will never be really sure whether the meat they buy is "hormone-free" or, in fact, full of black market additives, some of which might be dangerous to human health.

What, we would all like to know, is the government doing, or proposing to do, to protect British consumers, farmers and, indeed, the all-important scientific research industry in this and wider agriculture-foodstuffs areas, whose futures will be powerfully affected by the hormones ban?

We need answers to the following questions:

- (1) Does the Ministry of Agriculture, Fisheries and Food propose to compensate fully those farmers left holding stocks of the banned hormones?
- (2) Is the government planning any orchestrated public warning about the black-market dangers involved in this ban?
- (3) How is the ban on implants to be policed, with what expected effectiveness, at what cost, and at whose expense?
- (4) Has the government considered, or discussed with other governments, the consequences of the ban on our trade relations with the US, Australia, Brazil, Argentina and other countries which export beef to Europe?
- (5) Has the government prepared contingency plans to deal with the situation next year when the European Court finds

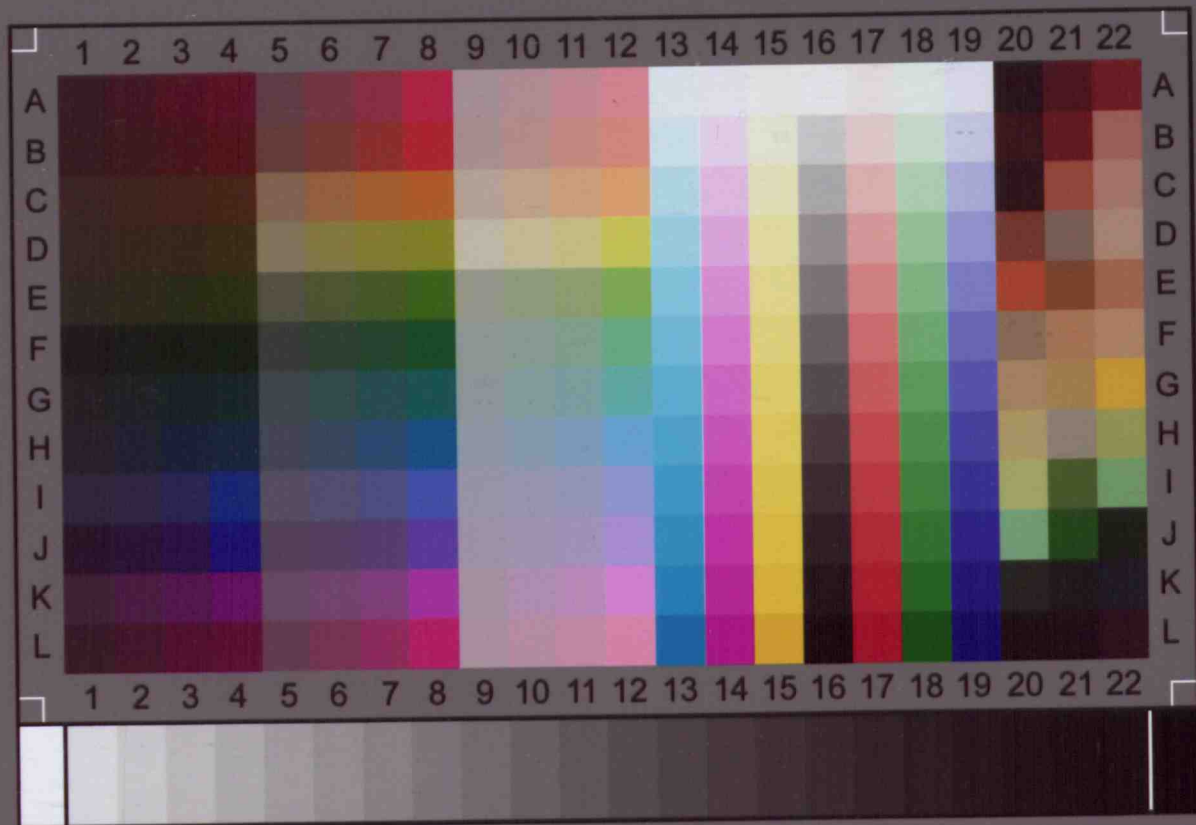


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