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### **Contributors**

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SELECT COMMITTEE ON  
SCIENCE AND TECHNOLOGY

PROPOSED  
SCIENCE AND TECHNOLOGY  
WHITE PAPER

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*Ordered to be printed 11 November 1992*

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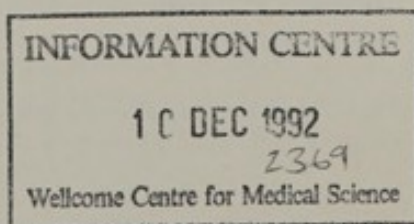
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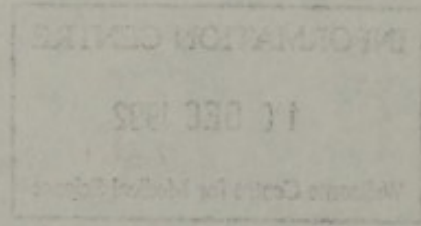
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CONVICTED

# THIRD REPORT

11 November 1992

By the Select Committee appointed to consider Science and Technology.

ORDERED TO REPORT:

## PROPOSED SCIENCE AND TECHNOLOGY WHITE PAPER

1 When the Chancellor of the Duchy of Lancaster, then newly appointed Minister for Science, gave evidence to the Select Committee on 8 July he invited us to take part in the consultations leading towards the preparation of his proposed White Paper on science and technology. The White Paper is expected to be published early in the New Year and the timetable required our views to be available by the end of November. Given the length of the Summer adjournment it would not have been possible to conduct a Committee inquiry on traditional lines. And we were conscious that this was an occasion when, in line with a conclusion of the *Select Committee on the Committee Work of the House*, a short, quick response was desirable (1991-92, H.L. Paper 35-I, pp.47 and 56). An inquiry would in any event have duplicated much of the Government's own consultative process.

2 The Committee therefore decided at its meeting on 15 July 1992 to prepare a submission on the basis of recommendations which had already been made in past reports, covering a wide spectrum of United Kingdom science policy and which (with occasional updating) we considered relevant to the current exercise. We observe that this course of action would not have been possible without the high degree of continuity and the breadth of activity which we have been able to achieve since the House first appointed our Committee in January 1980. At the end of the submission we offer answers, some of which are based on our own experience, to the specific questions raised by the Chancellor in his press notice of 9 July (OPSS 9/92) which we reproduce at Appendix 1. The letter from the Chairman to the Chancellor which accompanied the submission is reproduced at Appendix 2.

# THIRD REPORT

11 November 1992

By the Select Committee appointed to consider Science and Technology

ORDERED TO REPORT

## PROPOSED SCIENCE AND TECHNOLOGY WHITE PAPER

1. When the Chancellor of the Exchequer, then newly appointed Minister for Science, gave evidence to the Select Committee on 4 July he invited us to take part in the consultation leading towards the preparation of his proposed White Paper on science and technology. The White Paper is expected to be published early in the New Year and the timetable required for us to be available by the end of November. Given the length of the Summer and autumn it would not have been possible to conduct a Commission inquiry on traditional lines. And we were conscious that this was an occasion when, in line with a conclusion of the Select Committee on the Committee Work of the House, a short sharp response was desirable (1991-92, H.L. Paper 32-I, pp. 47 and 56). An inquiry would in any event have duplicated much of the Government's own consultative process.

2. The Committee therefore decided at its meeting on 13 July 1992 to prepare a submission on the basis of recommendations which had already been made in past reports, covering a wide spectrum of United Kingdom science policy and which (with occasional updates) we considered relevant to the current context. We observe that this course of action would not have been possible without the high degree of continuity and the breadth of activity which we have been able to achieve since the House first appointed our Committee in January 1980. At the end of the submission we offer answers, some of which are based on our own experience, to the specific questions raised by the Chancellor in his presentation of 9 July (CPS 992) which we reprinted in Appendix I. The letter from the Chairman to the Chancellor which accompanied the submission is reproduced in Appendix 2.



**SUBMISSION FROM THE HOUSE OF LORDS  
SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY  
TO THE CHANCELLOR OF THE DUCHY OF LANCASTER  
ON THE PROPOSED SCIENCE AND TECHNOLOGY WHITE PAPER**

1 We believe that science has an inherent and enduring cultural and educational value. Science also provides the basis on which major economic advances have been made. Therefore we also believe that the application and exploitation of science is of paramount importance to the economic welfare and industrial competitiveness of the nation.

2 In providing public funding for science it is hardly surprising that the Government regard it primarily as a component of economic growth and material progress. Indeed, this is reflected strongly in the Chancellor's list of questions, most of which relate to innovation, competitiveness, and value for money, while not one relates solely to cultural value or educational endeavour. We hope, however, that in their White Paper the Government will recognise the value of science to society in its broadest sense.

3 We have prepared our submission on the basis of recommendations made in past reports which (with occasional updating) we considered relevant to the current exercise. At the end we offer answers, some of which are based on our own experience, to the specific questions raised by the Minister in his press notice on 9 July 1992.

***The establishment of the Office of Science and Technology***

4 We welcome the establishment of the office and the appointment of the Minister for Science. As we said in our recent short report, *Office of Science and Technology* (1992-93, H.L. Paper 25):

"The Committee welcome the establishment of the Office of Science and Technology under the ministerial responsibility of the Chancellor of the Duchy of Lancaster, who will taken day-to-day responsibility, acting on behalf of the Prime Minister, for science and technology.

The appointment of the Chancellor of the Duchy is consistent with recommendations of the Science and Technology Committee in their reports on Science and Government in 1981 and on Civil Research and Development in 1986 (*Science and Government*, 1981-82, H.L. Paper 20; *Civil Research and Development*, 1986-87, H.L. Paper 20) in which we recommended that a specific Cabinet Minister be designated to speak for science and technology in conjunction with his other responsibilities.

At that time, the Committee did not envisage the setting up of an executive ministry. Thus the decision to establish the Office of Science and Technology and the transfer to it of the Science Budget goes further than we had in mind in the 1980s. We have, however, become increasingly uneasy about the recent treatment of the Science Budget within the former Department of Education and Science (*Science Budget 1991-92*, 1990-91, H.L. Paper 37). The machinery of government changes which have been made potentially may help to develop a coherent policy and we therefore support them."

5 The intention of producing a White Paper is also very much to be welcomed and we set out below our views on some of the issues which it might address.

***Policy objectives of Government support for science***

6 In our report *Civil Research and Development* (1986-87, H.L. Paper 20-I, p.41) we said that a recognised policy for the public support of R&D was required and that the objectives of that policy should include

- "(i) *The pursuit of excellence.* Excellence in science and technology is vital in itself and because the excellent stimulate and teach others. Sustained mediocrity is a waste of resources. Funding must put the pursuit of excellence before uniformity.



- (ii) *A constant flow of skilled manpower.* This is required both to carry out R&D in the United Kingdom and also so that the results of R&D national and international, will be appreciated and applied. The objective is relevant from primary school upwards.
- (iii) *A healthy foundation of basic science,* without which R&D cannot flourish.
- (iv) *Assured programmes of strategic research,* to ensure the United Kingdom's long-term economic prospects and its active participation in the next generation of technology.
- (v) *Competitive industrial performance* in international markets, with strong support through pump-priming and economic policies to secure (in particular) long-term investment in development ("D") with market potential."

As means to achieve objectives (i) to (v), we considered necessary

- "(vi) *Stable conditions for funding,* to encourage forward planning and inspire confidence.
- (vii) *A positive attitude to participation in European and other international collaborative programmes.*
- (viii) *Awareness of the potential impact of other policies on R&D* (for example, tax or public purchasing policies)."

7 Over time the emphasis accorded to these objectives may change. For example, we now consider an adequate and sustained, rather than a constant, flow of skilled manpower to be desirable. But subject to that qualification we confirm and emphasise the views we expressed in 1986. The fundamental policies that we hope will be set out in the White Paper - even on such matters as value for money, priorities, marketability of basic research or a free market in research - should be measured against these objectives and the conditions they require.

#### ***Government spending on basic research***

8 In our report *Science Budget 1991-92* we concluded that the settlement for that year had fallen far short of what was required to provide for the continuing development of the country's science base and that the real increases which had undoubtedly occurred since 1979-80 were more modest than the Government itself believed. Moreover, the increases in the Universities Funding Council's funding for research through the "dual support" mechanism over the same period had been negligible.

9 ACOST's recent report *The Science Base: Research in Universities* confirms the main thrust of our findings. At page 40, it is stated that the Science Budget increased by 33% in real terms (ie, GDP deflator terms) between 1977-78 and 1990-91, but was set to fall by 4% between 1990-91 and 1992-93. Using the Universities Pay and Prices Index (UPPI), on the other hand, which more accurately reflects inflation in the university sector, there was a 16% rather than 33% increase.

10 UFC funding of research rose in real (GDP deflator) terms by only 4% between 1977-78 and 1990-91, and was set to fall by 9% between 1990-91 and 1992-93. Using UPPI, on the other hand, UFC support actually fell by 10% between 1977-78 and 1990-91.

11 Thus, the income of the science base as a whole derived from the then Department of Education and Science rose by 19% in real (GDP deflator) terms over the period 1977-78 to 1990-91, and was planned to fall by 6% by 1992-93; or, using UPPI, the increase from 1977-78 and 1990-91 was only 3%.

12 ACOST itself has recommended that "the Government should build on the 1992-93 public expenditure settlement by providing extra funding for the science base in future years, above the increase necessary to keep pace with inflation" (ACOST Report pp.5 and 21).

13 We urge that ACOST's advice be heeded. In defending the value of the science base the Minister will need close co-operation with the Higher Education Funding Councils (HEFCs) which have succeeded the UFC (see paragraphs 44-46 below).



### *Departmental spending on applied research and development*

14 In our report on *Civil Research and Development* we concluded that the level of R&D being funded and performed within industry was inadequate. While we acknowledged that the main responsibility for funding development rested with industry we nevertheless took the view that Government had a major role to play in helping the private sector to help itself. (We also noted then how R&D was commonly the first area to suffer in recession!)

15 We returned to this in our report on *Innovation in Manufacturing Industry* (1990-91, H.L. Paper 18-1) and set out a large number of specific recommendations for Government action, nearly all of which were at that time rejected by the Government. Many of these have recently received wide public approval and we see no reason to repent of them. While they are principally directed at the Department of Trade and Industry both as regulator and as a major research funder we reiterate them here on the assumption that the White Paper - if it is to consider the means of enhancing both public and private funding of R&D - is bound to have DTI endorsement.

16 We recommended, amongst other things, in that report that:

- Government should devote a higher proportion of public funds to innovation in manufacturing industry. Failure to maintain the national R&D budget gives the wrong signals to industry about the importance of R&D and the innovation process to the national economy (paragraphs 9.68, 9.69).
- The DTI budget for industrial innovation should be restored to the levels of the mid-1980s and active industrialists should advise on its disbursement (paragraph 9.70).
- Properly targeted selective Government support for innovation can be of great value. The present level of support is below the optimum (paragraph 9.71).
- Government has a legitimate role in identifying and promoting generic technologies and industrial sectors of key importance for the future. ACOST should be invited to advise the Prime Minister on this and that advice should whenever possible be made public (paragraph 9.73).
- Government support is particularly appropriate for SMEs. We welcome the introduction of new schemes to assist them and urge that they should be adequately funded (paragraphs 9.75, 9.76).
- We welcome recent changes in the LINK scheme and hope they will encourage greater take-up of funds (paragraph 9.77).
- Launch aid should be extended to support high risk large scale product developments in sectors other than aerospace (paragraph 9.78).
- SMART and the Enterprise Initiative should be expanded. SMART should not be subject to cash limits (paragraph 9.84).

17 We reaffirm our belief that Government support must be properly targeted - for example the need for support for SMEs will vary from one industrial sector to another. We also think that Government support for R&D and innovation in industry should be only one aspect of an industrial policy which enables industry to help itself. Unless industry has a financial stake in Government funded industrial R&D it is less likely to apply it. Thus we reaffirm the recommendations in *Innovation in Manufacturing Industry* on financial mechanisms, which we set out fully at paragraph 51 below.

18 We have set out so many of our recommendations from *Innovation in Manufacturing Industry* because of the industrial slant of the questions set out in Mr Waldegrave's July press notice, which we specifically address at the end of this paper. Over the years, however, our Committee has reported on many aspects of departmentally funded science - agricultural, environmental, biological, medical, and nuclear to name but some. We recognise with regret that these appear to be of less direct interest to the current exercise (see also paragraphs 1-3 above).



### *Total government spending on R&D - international comparisons*

19 We have frequently drawn attention to the manner in which the United Kingdom's high spending on defence R&D, much of which is not R&D at all, distorts international comparisons of total United Kingdom government R&D spending (*Definitions of R&D*, 1989-90, H.L. Paper 44; *Classification of Defence Research Expenditure*, 1991-92, H.L. Paper 47). We are pleased to see that civil and defence R&D spending figures are now disaggregated in the Annual Review of Government Funded R&D, though the distinctions are still often conveniently forgotten in ministerial and other pronouncements.

20 In this context we draw attention to the sorry picture revealed at section 2.6 of the Annual Review. Government expenditure on R&D in 1990 as a percentage of total government expenditure was 3.9% for the United Kingdom compared with 4.6% for Germany (1989), 6.2% for France, 3.8% for Italy, 3.1% for Japan (1989), 3.5% for Sweden (1989) and 6.0% for USA (1989). As a percentage of GDP, the United Kingdom total Government R&D expenditure in 1990 was 0.90%, compared to 1.04% for Germany, 1.42% for France, 0.74% for Italy, 0.45% for Japan, 1.22% for Sweden and 1.18% for USA.

21 But the comparative picture for civil science alone is even less favourable. Thus, for example, while government expenditure on civil R&D in 1990 as a percentage of total government expenditure was 2.16% in the United Kingdom, it stood at 3.71% in France, 3.56% in Italy and 4.0% in Germany (1989). As a percentage of GDP, United Kingdom government expenditure in civil R&D in 1990 was 0.51% in the United Kingdom compared to 0.85% in France, 0.7% in Italy and 0.9% in Germany. Furthermore, as successive volumes of the Annual Review can be made to show, these comparisons have frequently become less favourable to the United Kingdom over the last decade.

22 One of the tasks of the Minister must be to encourage the closure of some of these gaps. In *Definitions of R&D* we stated that "...Although there is some correlation between R&D and innovation, the volume and character of R&D constitute only a partial guide to scientific excellence or to innovative performance" (p.6). The link between R&D spending and economic performance is by no means direct due, amongst other things, to variable take-up and lead times. But it is a fact that those competitor countries which have consistently spent proportionately more than the United Kingdom on civil R&D in recent years have successfully exploited science and technology and have significantly out-performed us. Therefore we urge the Minister to defend the value of civil R&D in real terms - whether the basic research conducted through the science base or the applied R&D largely funded through the Departments.

### *A strategic role for OST*

23 Just as, in the past, the Chief Scientific Adviser has advised on the scientific activities of spending departments, we would expect the Minister for Science and Technology to take the lead in determining an overall strategy for United Kingdom science. What we said about our proposed Council for Science and Technology in 1986 (*Civil Research and Development* p.44) can equally well be applied to the new Ministry as a whole. It should:

- take a balanced view of the whole of scientific and technological endeavour, international as well as British;
- monitor the connection between science and technology and the evolution of government policy;
- raise questions of strategic importance; and generally to promote the emergence of the most favourable conditions both for doing R&D and for getting the results usefully applied in Britain;
- promote interaction between the work of the research councils, universities and polytechnics, Government departments, private research institutions, industry and commerce;
- cover both civil and defence R&D, and seek to maximise the returns from all R&D;



- be concerned equally with publicly funded and private R&D and stimulate industry to increase its R&D activity;
- be a highly visible sign of the new importance that Britain must attach to science and technology for its industrial regeneration and future economic prosperity.

24 This means that the Office of Science and Technology (OST) will have to develop a clear understanding with other spending departments as to what should be their strategic goals. This will have to be enforced. Some have suggested that OST should have a budget for science over and above its funding of the research councils; or that OST operate a "dual key" system whereby major science and technology expenditure by departments would require their approval.

25 We suggest an alternative which might prove more acceptable to departments. They should, very much as the research councils do now, produce annually three year programmes for their R&D spending. These programmes should carry the endorsement of OST. The Treasury should not approve any PES bid for spending which had not been included in the forward programme, unless otherwise advised by the Chief Scientific Adviser.

26 The role of the Minister and his department in relation to other spending departments should extend not only to money but also to structures. Our Committee have had occasion in recent years to make recommendations on the organisation of spending on science within departments in the face of radical restructuring. In *Priorities in Medical Research* (1987-88, H.L. Paper 54-I) we made recommendations which eventually resulted in the creation of a Director of Research and Development for the Department of Health and the National Health Service. In *Nature Conservancy Council* (1989-90, H.L. Paper 33-I) we made numerous recommendations about the composition and scientific role of the Joint Nature Conservation Committee which were accepted by the Government. Frequently we have successfully recommended the establishment of over-arching mechanisms to rationalise science spending by a multitude of bodies. For example, in *Scientific Aspects of Forestry* (1979-80, H.L. Paper 381-I) we recommended that the applied research of the Forestry Commission and the basic research of other bodies should be brought together and, as a result, the Forestry Research Co-ordinating Committee was set up. A similar result was obtained with the establishment of the Co-ordinating Committee on Marine Science and Technology and its inter-agency successor body, following our report *Marine Science and Technology* (1985-86, H.L. Paper 47-I).

27 We consider that OST should be closely involved in all departmental or inter-departmental decision making on structural matters such as these so that the apparent lack of forethought on the part of government which we frequently encountered when we were preparing these reports can be avoided.

#### ***ABRC and the Research Councils***

28 We now turn to the research councils, the spending for which has been transferred from the former Department of Education and Science to the OST. The transfer raises a number of possible questions about the nature of the relationship between OST and the research councils and the position of the Advisory Board for the Research Councils (ABRC) in that relationship. The White Paper might well wish to address such questions as:

- (i) whether the United Kingdom should adopt a new unified research council structure;
- (ii) whether alternatively ABRC should assume more executive responsibility; or
- (iii) whether ABRC should be wound up, and its functions absorbed elsewhere within the department, so that research councils deal direct with OST.

29 The Committee have, in the past, never regarded the present research council structure to be immutable. In *Civil Research and Development* (p.46) the Committee found the idea of a National Research Council attractive on the ground that it would make for greater flexibility and a more comprehensive perspective of United Kingdom science. The Committee had found that marine science had been poorly served by the division of responsibility between SERC and NERC (p.46). More recently the Committee has found that systematic biology has also suffered from being nobody's baby (*Systematic Biology Research*, 1991-92, H.L. Paper 22-I). Newly emergent branches of science might also be better catered for under a unified structure (*Civil Research and*



*Development* p.45). At present these problems have to be met by joint co-ordinating committees of various kinds but usually not until considerable pressure for action has built up. When we published our report on *Civil Research and Development* six years ago we decided not to recommend radical action on the grounds that the costs would be felt before the benefits at a time when morale in the science community was "at an unprecedented low" (p.46). We favoured for the time being evolutionary progress through closer co-ordination between research councils and an increased executive role for ABRC, while "recognising that this might lead to the eventual unification of the Councils" (p.64).

30 In our interim report on Agriculture and Food Research we recommended in favour of an amalgamation of AFRC and NERC in a new Natural Resources Research Council. We saw this as part of the "evolutionary development of the research councils perhaps leading to eventual unification" (*Agriculture and Food Research Interim Report*, 1987-88, H.L. Paper 104, pp.8-9). In the meantime we rejected the idea of a new Biological Research Council.

31 Any decision to re-open the debate on a unified research council structure - as recommended in the Morris Report in 1989 - would therefore be consistent with the Committee's thinking in the past. We hope to involve ourselves in such a debate as part of our proposed investigation in 1993 of the methods and criteria for the support of basic research in the United Kingdom.

32 In the meantime we favour continued development of the ABRC's executive powers, bestowed as part of the Government's response to the Morris Report. In view of some of the financial problems which were encountered by SERC in 1990-91 (*Science Budget*, 1990-91, H.L. Paper 37-II, p.13) there might well be scope for greater intervention by ABRC in research councils' financial decisions, for example. We note ABRC's seeming reluctance to use their executive powers hitherto. This is perhaps inherent in their present membership which is not designed to provide independent judgment.

33 The question of whether or not ABRC should continue in its present form is one which will also fall to be considered by our forthcoming inquiry into basic research. But at the moment we consider it inevitable that ABRC should continue if only because there is no alternative source of advice to government on the multifarious claims of the research councils. ACOST is, for reasons set out below, in our opinion ill suited to take on such detailed work.

34 If, by contrast, a unified research council structure were to be adopted at some time in the future, there would probably be no need for ABRC to continue as an intermediary between the single research body and the OST. Moreover, if ACOST (see paragraphs 35-40 below) is to continue as a source of strategic advice there would be little left for ABRC to do.

### ACOST

35 The Advisory Council on Science and Technology (ACOST) was set up as a successor to the former Advisory Council for Applied Research and Development (ACARD) following a recommendation of the Select Committee in their report *Civil Research and Development* (1986-87, H.L. Paper 20-I) which had reiterated an earlier recommendation in our report *Science and Government*. It was envisaged that the Council would be chaired by the Prime Minister and this has, on occasion, happened. The establishment of ACOST was seen by the Committee to be complementary to the establishment of a strong Chief Scientific Adviser and the designation of a minister to speak for science within the Cabinet.

36 More recently, following an exchange of letters between the Chairman and the then Prime Minister, it has been agreed that ACOST should publish a triennial review of science and technology issues and its own programme of work. The first review was published in 1991.

37 Much of the work of ACOST is necessarily confidential. But many of the reports on particular topics which it prepares are published. These reports are prepared by standing committees of ACOST and by working groups, all of which involve members of the Council.

38 The Committee doubt whether the preparation of specialist reports by members of the Council is any longer consistent with their role in providing strategic advice on the lines set out in our original report at page 44, or indeed on the lines set out in ACOST's own terms of reference. We have not reviewed ACOST's work but some of our members have experience of its methods. We should like to see ACOST concentrate on the really big issues. (We note that Sir John Fairclough



in a recent speech on 9 July to the Foundation for Science and Technology was of like opinion.) The preparation of reports on specific issues should be entrusted to working groups of scientists and, where necessary, administrators. Reports might be requested, reviewed and adopted by ACOST but members should be relieved of any part in their preparation. Thus working groups could spend more time on their investigations - possibly adopting a more evidential process.

39 We think that these working groups should be appointed by OST on an ad hoc basis, taking advice where appropriate from the learned societies, and they would be served by the ACOST secretariat as at present. We do not consider it appropriate that the learned societies should be invited to take on this role. Their strength is their independence and their initiative should be unfettered. In any event, such reports are likely to carry more weight if they originate from what will effectively become ad hoc departmental committees.

40 It follows that it would be inconsistent with the role of ACOST as we see it for it to be engaged in the detailed scrutiny of research council bids each year, though for the time being it should certainly consider ABRC's advice.

### ***The Ministerial Committee of the Cabinet***

41 We welcome the fact that the existence of the Ministerial Committee on Science and Technology has now been acknowledged (HC Deb 6 July 1991 Col 361). Its membership is set out in the Cabinet Office document of 19 May 1992 which listed Ministerial Committees of the Cabinet. It is chaired by the Prime Minister.

42 When we wrote our report on the *Science Budget 1991-92* we wondered what role, if any, was ever played by that Committee in reviewing the acceptability of government spending decisions on science and technology. We considered that some of the choices which research councils were being forced to make were "too big to be left to councils alone without political guidance as to what was required of the science base in the context of present spending plans" (1990-91, H.L. Paper 37-I, p.15). We recommended that the ministerial committee should involve itself in the PES process for science.

43 By extension, the Ministerial Committee which in the past, we suspect, met less frequently than it might have, should be invited to consider other issues of strategic interest too.

### ***Higher Education Funding Councils***

44 As part of the setting up of OST, responsibility for the Science Budget, ABRC and DES Science Branch have been moved to the new Office. Responsibility for University funding - the other limb of the Dual Support System - remains with the Department for Education. As we noted in our report on the *Science Budget 1991-92* (1990-91, H.L. Paper 37-I, p.17), formal contact between ABRC and the Universities Funding Council (predecessor of the HEFCs) had virtually ceased. This was a matter of regret to us and we recommended that formal representation of UFC on ABRC and vice versa be restored. Some progress has recently been made in this direction to the extent that the Chairman of ABRC now attends meetings of HEFCE.

45 There is an added issue in that the two sources of funds for research have latterly been distributed according to different criteria. The UFC (and now the HEFCs) allocated research money to universities according to results of a selectivity exercise heavily influenced by overall performance review, but the universities have considerable discretion as to how that money is spent. As funds for university teaching became more scarce, money notionally allocated for research may increasingly be diverted away from that activity. Research council spending (and, incidentally, that of the charitable foundations) is allocated by project according to peer review. Seemingly, nobody has considered systematically the combined effects of dual funding.

46 Now that the two branches of spending on Dual Support rest in two different departments the need for some explicit mechanism of co-ordination becomes even more essential. This is reinforced by the fact that research and science teaching at universities are heavily interdependent and, of course, funding of teaching also rests with the HEFCs. We hope therefore that the White Paper will address this question so that, for the purpose of research funding, universities will continue to be regarded as whole institutions. Without some such mechanism, in any case, OST will be unable to fulfil its responsibility for the science base.



### *International collaboration*

47 The appointment of a Minister for Science and the establishment of the OST will undoubtedly facilitate international scientific collaboration. OST will take over the Cabinet Office's co-ordinating role here and the Chancellor of the Duchy will attend meetings of science ministers, for example at EC level. We greatly welcome this.

48 In our report on *International Scientific Programmes* (1990-91, H.L. Paper 24-I) we detected that the wider scientific community sometimes felt that they had not been involved in discussion making - particularly with regard to the context of the EC Framework Programme. We were pleased to note the Cabinet Office's early initiatives both within the science community and at EC level with regard to the content of the Fourth Framework and we hope that OST will continue this.

49 Nevertheless we remain concerned about some of the financial consequences of collaboration. The practice of attribution and additionality with regard to funds received by United Kingdom science from the EC is potentially highly unsatisfactory for reasons set out in our report (pp.24-26, 32). And we remain unconvinced by the refutations so far offered by the Government. We are also concerned at the effect of exchange rate movements on United Kingdom contributions to large facilities. Our recommendation that research councils be indemnified by the Treasury for the costs of currency movements beyond the narrow band fluctuations of 2½% envisaged by ERM was rejected by the Government. But the recent devaluation of the pound has both drawn attention to this problem once again and made it more urgent. We hope that the White Paper will review Government policy in these two areas.

### *The Chancellor's List of Questions*

50 Why does the United Kingdom seem to be less successful than its competitors in translating inventions to the market place? Why is this more so in some industries than others?

In *Innovation in Manufacturing Industry* (1990-91, H.L. Paper 18-I) we identified a number of cultural and historical influences which inhibited innovation in the United Kingdom (p.7). But we also identified a number of structural and performance features of innovative companies (pp 9 and 11) which give a good indication of why the picture varies from firm to firm and sector to sector.

51 Do we have an agreed measure of the capacity of an industry, or a firm, to innovate? Do we really know whether our firms are getting better or worse at innovation? Do technology-based innovative firms survive longer? Is the alleged lack of innovation a lack of good ideas, or finance, or what?

During our investigation into *Innovation in Manufacturing Industry* we found that there was no obvious measure of innovation and tended to rely on the commonly used macro-economic indicators such as Gross Domestic Expenditure on R&D (GERD), Gross Fixed Capital Formation (GFCF), and net fixed investment by manufacturing industry (p.5). We are aware of subsequent attempts to identify the R&D record of individual companies in the annual *UK R&D Scoreboard* published on the initiative of the DTI's Innovation Advisory Board, though we are equally aware that the different bases adopted by companies for calculating their R&D expenditure make comparisons and aggregations difficult.

We were convinced by the evidence we received on *Innovation in Manufacturing Industry* that innovation was the key to the survival of technology based firms (pp.4-5).

We identified a large number of financial disincentives to innovation in the United Kingdom. These are set out in our report at pp.14-21. They included short termist attitudes in the City militating against investment in R&D by over emphasis on growth of earnings per share as a measure of corporate performance; the effects of the takeover culture; high and fluctuating interest and exchange rates; and inimical taxation and accounting practices. Our recommendations in this area were:

- The high cost of capital is a massive disadvantage faced by British industry. Wherever possible obstacles to investment should be reduced (paragraph 9.40).



- The Government should explore again the possibility of preferential interest rates for innovation in industry (paragraph 9.72).
- One hundred and fifty per cent of industrial expenditure on R&D should be exempt from taxation, based on the amount of real additional expenditure which a company makes over its previous year's total (paragraph 9.41). Such allowances should only be available to companies which declare their expenditure in line with SSAP 13, which should be made a legal requirement (paragraph 9.42).
- Government should review the activities of local tax inspectors in their interpretation of the law relating to tax relief on capital spent on development (paragraph 9.43).
- Companies should be allowed to choose for themselves the rate of depreciation against tax for plant and machinery. It should be the same rate as that shown in their published accounts. This change should not be accompanied by a return to a higher rate of corporation tax (paragraphs 9.44, 9.45).
- The high incidence of takeovers is damaging to manufacturing industry and warrants action, even though there are cases when merger is beneficial (paragraphs 9.60, 9.61). Voting rights should be enjoyed only by shareholders who have held their shares for at least a year. Companies legislation should be amended to that effect (paragraph 9.63).

## 52 Do we need more or less planning in Government science and technology?

We consider that continuity of research provision and the definition and pursuit of strategic areas will require Government foresight and resolve of a different quality from that which predates the setting up of OST.

## 53 Do we get optimum benefit from our international collaborative programmes, especially in the European Community, and do they complement our national programmes well?

United Kingdom participation in research at international facilities enables research to be carried out which would prove too expensive to conduct solely at national level (*International Scientific Programmes*, 1990-91 H.L. Paper 24-I, p.10). To that extent they give optimum benefit but their opportunity cost has always to be recognised and their continued support must always be seen in the context of competing claims for funding.

The EC Framework Programme was, we found, a popular source of funds for United Kingdom research and take up was good. It is open to question, however, whether the research is always complementary to United Kingdom funded research. It was regarded by witnesses as an alternative to United Kingdom funding. We were told by some that, if funded from United Kingdom sources, their research could be conducted far more efficiently and cheaply. Moreover we remain concerned that the practice of attribution will adversely affect the perceived value of EC funding to United Kingdom scientists.

The extent to which EC research projects complement United Kingdom activity very much depends on the extent to which the Framework is aligned with United Kingdom research interests. We note with approval the Cabinet Office/OST efforts in preparing for the Fourth Framework.

## 54 Does the United Kingdom get the very best value for money from Government's considerable expenditure on science and technology?

**Are spending priorities right or would the Government be better advised to spend money in other areas of science and technology than the ones it funds at present?**

Much basic research is not amenable to "value for money". It is nevertheless the case that much "blue sky" basic research does result in industrial applications which, after the event, may give it a value which distinguishes it from other areas of basic research for which no such applications as yet exist.



But as eventual applications may not always be clear at the time, "picking winners" in basic research is dangerous and not to be taken lightly.

We acknowledge, however, that the Government is perfectly entitled - and is to be encouraged - to select strategic or generic areas for funding, on a rolling and continually evolving basis.

**55 Does the Government have the right advisory structures at its centre to help it take decisions on priorities?**

Our views on ABRC, ACOST and the Ministerial Committee are set out at paragraphs 25-40 above.

**56 How can we best ensure that the strong upward trend in industrial R&D expenditure in the United Kingdom will continue and gather pace in the years to come, so that our record is as good as the best of our international competitors?**

We refer the Chancellor of the Duchy to our views on levels of government funding of R&D as set out in paragraphs 8-22 above. Industrial funding may be enhanced by applying some of the financial incentives set out in our report *Innovation in Manufacturing Industry*, listed in paragraph 51 above.

**57 Could the links between academia and industry be improved to encourage maximum exploitation of the science base?**

We found in our report *Innovation in Manufacturing Industry* that links between universities and industry, while improving, could be improved further. We called for greater involvement of academics on the boards of companies to match the well established participation of business in higher education. We found that the most effective means of transferring knowledge from the one sector to the other was by personal contact (pp.12-13, 33-4, 41).

Our current study into the proposed Faraday Programme has led us to conclude provisionally that contiguity of the proposed Centres both with universities and with industry will be essential if they are to succeed. We also feel that existing mechanisms ought to be improved upon, whatever the outcome on Faraday Centres.

**58 Is the United Kingdom working in areas of basic science which have less marketable derivatives than those on which our international competitors concentrate their efforts?**

We cannot recall this ever being said in the vast amount of evidence by now presented to us and have no reason to believe it to be the case.

**59 Is there scope for improved training opportunities in science and technology?**

We think that there is considerable scope for improvements in education and training opportunities in science and technology. We pointed this out in our report *Education and Training for New Technologies*, (1984-85, H.L. Paper 48-I) and we would refer the Chancellor of the Duchy to our recommendations on pp.71-76. Although we did not consider training in detail in the context of our report *Innovation in Manufacturing Industry*, we found that the same needs and the same shortcomings persisted (pp.21-23).

**60 What steps do we need to take to improve the status of scientists and engineers?**

There is a paucity of scientists and engineers in the higher echelons of industry and the public service.

In spite of the introduction of the National Curriculum, school-children still specialise too early. Scientists, managers and administrators would have more in common and be more readily interchangeable were this not the case.



In any event, private industry should appoint more scientists and engineers to their boards. Government should also appoint more scientists and engineers to senior posts in the public service.

In the context of engineers, the Government might look again at the recommendations of the *Report of the Committee of Inquiry into the Engineering Profession: Engineering Our Future* (the Finniston Report) (Cmnd. 7794), which we endorsed in *Engineering Research and Development* (1982-83, H.L. Paper 89-I, p.58).

## APPENDIX 1

*Cabinet Office Press Notice***CABINET OFFICE**  
*Office of Public Service and Science***NEWS RELEASE**OPSS 9/92  
9 July 1992**WILLIAM WALDEGRAVE LAUNCHES CONSULTATION ON  
SCIENCE AND TECHNOLOGY WHITE PAPER**

William Waldegrave, Chancellor of the Duchy of Lancaster, today identified a number of key issues which he wished to address in the White Paper on science and technology.

He told the Foundation for Science and Technology that he would be consulting widely during the preparation of the White Paper, which would set out ideas about the future of science and technology in the United Kingdom and the Government's role.

"All of us share a common interest in science and technology and we have a deep conviction about the vital contribution it can make to our quality of life and our economic performance," he said.

"I look forward to presenting a robust case for science and technology in the years ahead and will look to your help in doing so."

Mr Waldegrave said the White Paper, which he hoped to publish in the early part of next year, would deal with organisational questions, but would also discuss ideas relating to the exploitation of science and the application of technology.

"While I have learned a lot since taking office from the many discussions I have had with representatives of the scientific community, I do not pretend to have all the answers. I am, however, beginning to identify some of the key questions:

- Why does the United Kingdom seem to be less successful than its competitors in translating inventions to the market place? Why is this more so in some industries than others?
- Do we have an agreed measure of the capacity of an industry, or a firm, to innovate? Do we really know whether our firms are getting better or worse at innovation? Do technology-based innovative firms survive longer? Is the alleged lack of innovation a lack of good ideas, or finance, or what?
- Do we need more or less planning in Government science and technology?
- Do we get optimum benefit from our international collaborative programmes, especially in the European Community, and do they complement our national programmes well?
- Does the United Kingdom get the very best value for money from Government's considerable expenditure on science and technology?
- Are the spending priorities right or would the Government be better advised to spend money in other areas of science and technology than the ones it funds at present?
- Does the Government have the right advisory structures at its centre to help it take decisions on priorities?"



Mr Waldegrave also referred to the questions he identified in the House of Commons debate on science and technology on 11 June:-

- How can we best ensure that the strong upward trend in industrial R&D expenditure in the United Kingdom will continue and gather pace in the years to come, so that our record is as good as the best of our international competitors?
- Could the links between academia and industry be improved to encourage maximum exploitation of the science base?
- Is the United Kingdom working in areas of basic science which have less marketable derivatives than those on which our international competitors concentrate their efforts?
- Is there scope for improved training opportunities in science and technology?
- What steps do we need to take to improve the status of scientists and engineers?

Mr Waldegrave added: "The last thing I want to do is to arouse hopes which I cannot fulfil, but I am keen to promote a debate on science and technology. I am sure this evening's discussion will provide a valuable part of that exchange."

### *Notes for Editors*

The White Paper is planned for publication in the early part of 1993.

Views on the issues identified by Mr Waldegrave should be sent to Professor Bill Stewart, Room 310, Office of Science and Technology, Cabinet Office, 70 Whitehall, London, SW1A 2AS by 30 November 1992.

Issued by:

Information Services Division  
Cabinet Office (Office of Public Service and Science)  
Horse Guards Road  
LONDON SW1P 3AL  
Tel: 071 270 6356/6370



## APPENDIX 2

*Letter from the Chairman to the Chancellor of the Duchy of Lancaster*

18 November 1992

**PROPOSED SCIENCE AND TECHNOLOGY WHITE PAPER**

I enclose the submission from the House of Lords Select Committee on Science and Technology on the proposed science and technology White Paper, as agreed to by the Committee at their meeting on 11 November. The Committee decided to make it a report to the House and it will therefore be published early next week.

To avoid duplicating the Government's own consultative process and to enable us to respond within your timetable, we dispensed with usual practice and have based our response on recommendations made in past reports, with occasional updating. At the end, we offer answers to the specific questions raised in your Press Notice of 9 July, some of which are perforce based on members' own experience.

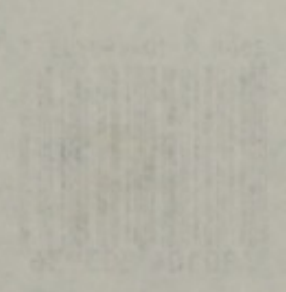
The submission was agreed before the Autumn Statement of 12 November and therefore takes no account of it.

I hope that you will find our comments helpful. We wish you and your officials well in the important task you have set yourselves.

**FLOWERS**

The Rt Hon William Waldegrave MP  
Chancellor of the Duchy of Lancaster  
and Minister of Public Service and Science  
Cabinet Office  
70 Whitehall  
London SW1A 2AS

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## APPENDIX 2

### THE HOUSE OF LORDS: JOURNAL OF THE DEBATE OF THE 12th NOVEMBER 1992

12 November 1992

## PROGRESS SCIENCE AND TECHNOLOGY WHITE PAPER

I declare the acceptance from the House of Lords Select Committee on Science and Technology of the progress science and technology White Paper, as agreed to by the Committee at their meeting on 11 November. The Committee decided to make it a report to the House and it will therefore be presented early next week.

The Committee recognises the Government's own consultative process and in particular its response to the 'open' consultation, its discussion with 'civil practice' and have based our response on recommendations made in past reports, with occasional updating. At the end, we offer answers to the specific questions posed in your Press Notice of 4 July, some of which have provoked several members' own questions.

The statement was agreed before the 4 o'clock Statement of 12 November and in accordance with no account of it.

I hope that you will find our comments helpful. We wish you and your officials well in the important task you have set yourselves.

FLOWERS

The Hon. William Watkinson MP  
Chairman of the House of Lords  
and Member of Public Accounts and Finance  
Committee  
12 November 1992  
London W1A 1AA

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