



Council for Science and Technology

# **Review of S&T Activity across Government**

**Report by the  
Council for Science and Technology**

**JULY 1999**

# **REVIEW OF S&T ACTIVITY ACROSS GOVERNMENT**

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### **Introduction**

Following the conclusion of the Comprehensive Spending Review, the Council for Science and Technology was invited in September 1998 to undertake a review of departments' use of science and technology (S&T)<sup>1</sup>, and to consider what lessons may be drawn for Government S&T policy as a whole. The Council established a sub-group to undertake a short, strategic review. The members were: Sir Robin Nicholson (chair), Dame Bridget Ogilvie, Sir Richard Sykes, Dr Chris Evans and Professor Sir Keith O'Nions. This is our report.

### **Review Process**

2. We held two rounds of meetings and considered written material from the five Government departments with the largest S&T expenditure: Ministry of Defence (MOD); Ministry of Agriculture, Fisheries and Food (MAFF); Department of the Environment, Transport and the Regions (DETR); Department of Trade and Industry (DTI); and the Department of Health (DH). We met senior officials involved in each department's science and technology/research activities: in some cases, policy officials were also involved. We also consulted the Director General of the Research Councils.

3. Departments use S&T to inform policy, improve delivery of services, including support for industry, and to get quality decisions on procurement. Their involvement in S&T can be summarised under three headings: awareness of existing knowledge; the application of existing knowledge to solve problems; and the development of new knowledge to fill

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<sup>1</sup> For the purposes of this report the terms 'science' and 'science and technology' include science, engineering and technology.

essential gaps. During the course of our meetings, we explored a variety of aspects of the ways in which departments use S&T. In particular, we considered:

- the purpose of departmental S&T spending;
- how departments decide what they should spend money on; and
- the level of scientific management and scientific literacy in Departments.

4. The departments we studied are concerned primarily with 'hard' sciences and their application, including engineering. All however recognised the importance of the social sciences in their work. We would expect many of our findings and recommendations to be equally applicable to departments which make more use of the social sciences than of other forms of science and technology.

5. Our conclusions and recommendations cover:

- recognition of the central role that S&T does or should play in the policy formulation, decision taking and executive actions in departments;
- the need for a more forward-looking, strategic approach as a framework for short term departmental actions;
- the need for better connections, within Whitehall and with Research Councils, industry and international players;
- the use of science and technology in Government sponsorship;
- the impact of European programmes;
- people issues: scientific management and scientific literacy.

## **Central Role of S&T**

6. Science and technology are creating new challenges and new opportunities for Government, just as they are for all other elements of society. Departments and their Ministers need to recognise this essential truth through their involvement in S&T if they are to meet their responsibilities.

7. In the course of our review it became clear that overall the Government attaches considerable importance to the way in which S&T are used by departments. We saw examples of good practice in all the departments we visited, but we were not convinced that any department was really staffed, organised, or sufficiently aware to make the best possible use of science and technology in delivering their short and medium term objectives and targets; and in formulating their strategy for the longer term. We are concerned that the resulting weaknesses in their ability to understand, and to respond to, rapid change in the external world create an increasing risk that wrong decisions will be taken, with potential for substantial damage and costs to Government and society.

8. We were struck by the part played by history in the levels and distribution of Departments' S&T expenditure. This is to some extent appropriate. Research and development programmes are often long term in nature. Funding to maintain key capabilities cannot be turned on and off. That said, pressures to maintain historical levels of funding in particular programmes, for example from industry lobbying, international and legal commitments, can effectively constrain departments' ability to reflect changing priorities. This makes for a long, slow process to alter resource allocation, yet budgets may need to change substantially to reflect future needs.

## **A Science Strategy**

9. We recommend that Ministers should require all departments to take a strategic approach to science and technology. Departments should develop strategies which are directly related to the priorities and objectives set out in their Public Services Agreement. Strategies also need to be longer-term, looking beyond the timescales of the expenditure review process or the life of a Parliament, not least because of the long-term nature of research. Such science strategies should:

- identify the impact which science and technology are likely to have on their ability to deliver short and medium term goals expressed in their Public Services Agreement (PSA);
- identify measurable objectives for the use of science and technology, including research spending, that they need to deliver these goals;
- take full account of the opportunities, threats and the key scientific issues Departments will need to address in the longer term;
- take full account of outputs from Foresight;
- consider the means by which they will ensure the long-term provision of scientific expertise and services to address these opportunities and threats.

10. Departments should measure performance against the identified objectives and draw on the outputs from the strategy in deciding future objectives and targets, for the next spending round.

11. Strategies should be "joined up" across Government and forward looking: Departments need to work with Research Councils and other key players. They should take full account of S&T activity in the UK science base and overseas, particularly in OECD countries. Departmental research programmes should fill gaps in knowledge: they should not reinvent the wheel. Foresight offers a useful process for developing a forward vision, in consultation with others, as well as a source of relevant material. It needs to be used more systematically across departments and Research Councils to inform spending decisions

12. Ministers should take overall responsibility for their Department's science strategy. A senior official should be accountable to their Permanent Secretary and Ministers for its development and delivery. We recommend that these strategies are brought together and reviewed by the Ministerial Science Group<sup>2</sup>.

13. Our recommendations would mean that all departments should have the capacity to take a central overview; and to challenge plans for the use of science and technology, and particularly for research, taken by those responsible for delivering policies and services. Beyond that, they do not necessarily imply central planning or central decision-making within departments. We recognise the power of systems, such as DETR's, in which decisions on science and technology, and particularly on research spending are made by those responsible for the policies and services which the science supports. In DETR each policy area is responsible for and holds the budget for its research. Research programmes are therefore linked directly to an individual policy area and support the corresponding policy objectives. The hardest challenges for such a system are to ensure that proper consideration is given to research which could call existing policies into question and that the appropriate linkages across Government are made.

14. By contrast MOD and DH have a centralised system in which the decisions on the priorities, content and balance of the research programme is taken centrally, typically by a committee of stakeholders. This approach has the advantage of pooling research management expertise and providing the flexibility to re-allocate resources to meet changing priorities, though it can be perceived as having a weaker link to departmental objectives, with a central research budget seen as a soft target for cuts. We would hope that, by thinking more strategically, departments could develop an approach which gets the best of both worlds, while organising research and budgeting in the way that suits them best.

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<sup>2</sup> The Ministerial Science Group is an informal Ministerial committee which promotes a co-ordinated and coherent approach to S&T policy making across Government, and has particular responsibility for overseeing the Foresight programme and the implementation of the OST guidelines on the use of scientific advice in policy making. The group first met on 24 February 1999.

## **Connections**

15. Departmental spending on science and technology is £3.8 billion a year (£1.3 billion from civil departments, £0.6 billion on defence research and £1.9 billion on defence equipment development). Research Councils spend £1.4 billion, with a further £1.1 billion from funding councils. We were concerned to find out how far these different blocks of spending related to each other, and whether there were important overlaps or gaps.

### **Between Government Departments**

16. Across Whitehall, there is plenty of co-operation on individual projects and programmes: DTI and DETR have worked together on environmental research and developing new technologies for transport; MAFF and DETR exchange data and information on GM crops; DTI and DETR work together on energy and climate change. However, the focus so far has been on identifying potential areas of duplication. We believe that it is also important for departments to co-operate in identifying weaknesses and gaps.

17. We saw different approaches by the five departments to the use of science and technology to meet their industrial sponsorship objectives. We recognise that this is not just a science and technology issue: it reflects wider differences in the approach of Government departments to their sponsorship responsibilities which are only partly justified by the different circumstances of the industries concerned. While DTI has a major responsibility in this area, other departments handle industrial sponsorship related to their main responsibilities and there could be a risk that some of the newer industries fall into the cracks between departments. There seems to be little cross-comparison and sharing of best practice between departments. We also noted the relatively low level of investment in the newer science-led industries compared with the assistance to traditional industries, often accounted for under different headings such as regional aid. It was not clear to us that the same criteria are being applied across Government, to all sectors, nor that due account is taken of the level of support in competitor nations. Arrangements for sharing views on priorities and approaches are patchy. Better communication between the departments concerned would help. We also believe there is scope for further

consideration of the balance between support for new and emerging technologies and established industries.

18. We believe that it is important that there should be someone in Government who takes overall responsibility for ensuring that science and technology are being well used in sponsorship activities across Whitehall. Such responsibility could either be limited to science and technology or take in the whole range of sponsorship activity.

### **With Research Councils**

19. The 1993 S&T White Paper, 'Realising Our Potential', sets out the mission of the Research Councils. They must promote and support high quality basic, strategic and applied research; and must place special emphasis on the needs of users of their research and training output. Research Councils also have an important role in producing highly trained people. The UK is highly dependent on such people to access and make use of the 90% of the world's scientific activity which is conducted outside the UK.

20. Under the Haldane principle, day to day decisions on the distribution of funding, including the balance between responsive mode research (where the excellence of the science is the only criterion) and directed mode research (to meet defined objectives) are a matter for the Research Councils, and should be taken at arms length from Government. In practice, Government departments are represented on Research Councils, alongside individuals from industry, and so have a say in shaping their spending. Councils take account of guidance on objectives and targets provided by the Secretary of State for Trade and Industry when their budgets are set. Departments make use of concordats and other means to share information on their priorities.

21. The relationship between DH and the Medical Research Council (MRC) differs from those of other Government Departments and Research Councils, reflecting the closeness of their missions. There is a partnership, also involving the Higher Education Funding Councils, to support clinical medical research. DH provides service support and facilities for MRC funded research (taking place in the NHS) and expects MRC to ensure that the corresponding research takes into account the needs of the NHS. This is an unusual arrangement which could be considered "cosy". However, in this instance, we believe it works well and is the most cost-effective arrangement available.

22. We conclude that the present system, while far from perfect, is generally working in the way originally intended. It implies that departments have to fund R&D to address gaps in the science base which are important to their priorities and which Research Councils for whatever reason are unwilling or unable to fill. This approach is consistent with the 1993 White Paper.

23. The system relies heavily on excellent communication between Departments and relevant Research Councils, so that each understands the others' priorities, and areas of weaknesses are jointly identified. Such communication is more evident in some areas than in others. We would hope that the process of working together to develop departmental strategies would improve communications in the areas where they are weakest.

### **With Government Departments Overseas**

24. We found that the extent to which departments were aware of or made use of information about S&T activities and levels of support by corresponding departments in governments overseas was patchy. We believe such information is valuable and should be obtained on a more systematic basis, particularly from OECD countries. We are not suggesting that this should determine what departments do but believe that such information represents an essential basis for benchmarking as well as for learning from others.

### **European Framework Programme**

25. No Department questioned the value of international collaboration. Nor do we. Many projects are best done on a collaborative basis. The Framework Programme encourages valuable links to be forged to the European science base and may result in some member states putting more money into research than they otherwise would. UK researchers value both the income and the networking it provides; well focused EU projects with good partners can provide good results.

26. We were concerned nonetheless that the Framework Programme does not represent good value for money. The UK contributes £400M per year to the Framework

Programmes and departments see it as much less effective in meeting their needs than comparable national programmes; even those which found the current system suited to their needs considered that there was considerable scope for improvement. Given a free hand, departments believe they would currently get better value through directly negotiated collaborative programmes. This is a formula successfully applied by MOD and by several departments in the European Co-operation in Science and Technology (COST) programme.

27. A top class European programme of collaborative research is essential if Europe is to compete economically and societally with other major blocs such as the USA and far eastern countries. The fifth Framework Programme is seen as moving in the right direction, with greater involvement of users, and improved focus on fewer objectives. But the actual value of the Framework Programme is severely eroded by the highly political nature of its negotiation. Whilst we accept that the top-line allocation of resources is a political process to meet the overall objectives of the EU, subsequent decisions on programmes are matters for expert advice from customer and user groups, as indeed happens in the national programmes of member states. We recommend that the UK Government initiates a searching review of the European Framework Programmes at the earliest possible stage in the development of thinking about the next Framework Programme (FP6), to identify ways to improve its value to Departments and other UK users. The Government should be prepared to take radical steps (in co-operation with European partners), including amendment of the research chapter of the Treaty if necessary. We believe that many member states would support such a review in order to generate better European value from the Framework Programme.

## **People: Scientific Management and Scientific Literacy**

28. Ministers need a variety of sources of advice to inform them on science and technology, and help to deliver services. As we have said earlier, they need to be plugged in to what is going on throughout the world by using, for example, Research Councils and scientific advisory committees. We fully endorse the guidelines for “The Use of Scientific Advice in Policy Making” issued by the Chief Scientific Adviser and welcome the involvement of the Ministerial Science Group in ensuring their implementation.

29. We believe that Ministers need to ensure that their departments have high quality people with knowledge and/or experience of science and engineering working directly for them, i.e. as part of the Civil Service. These people are needed to understand the issues posed by science, organise channels of communication and interpret scientific issues simply and clearly.

30. Such people do not need to be career civil servants. Indeed, there are many advantages in the practice of bringing some people in short-term, with direct and recent experience of science and technology in industry or the science base, so keeping networks live. Most Departments which have Chief Scientists or equivalent make appointments in open competition with a view to having a sufficiently wide pool of candidates to ensure the necessary competence, credibility with the scientific community and contacts with scientific networks. At middle management level DTI obtains expertise on particular market sectors from secondees and people brought in on short-term contracts.

31. We note, however, that a key source of recruitment to departments, particularly at middle management levels, has largely dried up as a result of the privatisation of, or arms length relationship with, research establishments which were previously staffed by civil servants. In the past these have provided a significant source of supply both of suitably qualified and experienced staff to manage departmental R&D programmes and of scientifically literate senior managers. Many staff now in central departments working on policies and programmes with a technical content have a background in the former research establishments. We found no evidence that this change had yet caused any weakness in the quality of scientific advice given to Ministers. But it seems to us that departments should now take action to ensure that careers in the Civil Service for people who want to work with science and technology are good enough to attract the brightest so

departments can meet their needs for an appropriate level of scientific expertise. We also believe there could be scope for more co-ordination across departments.

32. Departments should also consider making more proactive use of inward and outward secondments of scientific and technical staff at all levels, with Research Councils, Universities and the private sector.

33. We recommend that a senior official should be responsible to Ministers for the level of scientific expertise within each department, ensuring that it has staff of the right calibre to act as an intelligent customer for science and technology, and to ensure that the issues they raise are properly understood. Whilst it is for departments to decide the organisation that suits them best, we see much merit in brigading this responsibility with that described in paragraph 12, that is overall responsibility for science and technology and the development and delivery of the department's strategy. At present, Chief Scientists, heads of research departments, and in DH the Chief Medical Officer, each have part of this combined role. None, except MOD, have all of it.

## Conclusion

34. This represents the findings of a small group, with a wide variety of experience of science and technology. It does not seek to be in-depth or comprehensive. It is important to record that we saw much in the way the five departments manage their S&T activities that impressed us. We have concentrated in this report on the few key themes which struck all of us and which recurred in each meeting. We therefore recommend:

- a recognition of the central role of S&T in Ministerial and departmental accountabilities (paragraphs 6-8);
- a more strategic forward-looking approach to science and technology (paragraphs 9-14);
- that in each department, a senior official should be accountable for the development and delivery of the science strategy and that the strategies should be brought together and reviewed by the Ministerial Science Group (paragraph 12);
- better communications between departments and with the Research Councils and other governments, particularly in the OECD (paragraphs 16-25);
- a more consistent approach across Government to the use of S&T in industrial sponsorship and that someone in Government should take overall responsibility for this (paragraphs 17-18);
- a radical review, in co-operation with European partners, of the present approach to European collaboration (paragraphs 25-27);
- that departments consider collectively their needs for people with scientific and technical backgrounds and whether new actions are required both to meet these needs and to ensure that careers are good enough to attract the brightest (paragraphs 28-32);
- that a senior official should be responsible to Ministers for the level of scientific expertise within each department, ensuring that it has staff of the right calibre to act as an intelligent customer for science and technology, and to ensure that the issues they raise are properly understood (paragraph 33).

35. In our view, action on these recommendations will improve the capacity of the system to identify desired outcomes, and the resources required to deliver them, so providing a

basis for getting better value from science and technology activities. Ensuring adequate knowledge of S&T for departments' policy formulation, decision-making and executive actions costs money. However failure to ensure this can cost huge sums of money in terms of unsound policies, compensation payments and lost opportunities.

**Council for Science & Technology, July 1999**

## **Role and Membership of the Council for Science and Technology**

1. The Council is the Prime Minister's top level advisory body on medium to longer term strategic issues concerning the Government's policies and framework for ensuring that science and technology meet the needs of the United Kingdom. Its core task is to keep under review and make recommendations on ways of improving:

- the performance of the UK (public and private) in S&T, in relation to current and future national needs and opportunities;
- the overall impact of the funding arrangements for publicly supported S&T including those for research in higher education institutions;
- the effective use and exploitation of S&T by business, Government and the public services to create wealth and improve our quality of life; and
- the synergy between the UK's domestic and international S&T activities and the scope for the UK to get more benefit from S&T collaboration.

2. Each year, the Council addresses a limited number of issues, principally through sub-groups of members onto which additional people are normally co-opted to deal with that particular piece of work. Sub-groups may commission studies as background to their work.

3. Additionally, the Council provides its independent advice on a more specific strategic issue of national importance whenever this is sought.

4. The Council submits its independent advice in the form of reports to the Prime Minister through the Cabinet Minister for Science & Technology who is the Secretary of State for Trade & Industry and who chairs the Council on the Prime Minister's behalf. The Government's Chief Scientific Adviser is the Deputy Chairman of the Council and the Office of Science & Technology (OST) provides the Council's Secretariat.

5. The Council comprises 14 independent members:

Professor S Kumar Bhattacharyya CBE FEng

Professor Sir Alec Broers FRS FEng

Dr Chris Evans OBE

Professor Julia Higgins CBE FRS

Sir Aaron Klug OM PRS

Dr Rob Margetts CBE FEng

Sir Robin Nicholson FEng FRS

Dame Bridget Ogilvie ScD FIBiol FRCPATH

Professor Sir Keith O’Nions FRS

Dr David Potter CBE

Miss Emma Rothschild

Professor Sir Stewart Sutherland FBA

Sir Richard Sykes DSc FRS

Mr J Martin Taylor

6. The Council’s Secretary is Mr Steve Elton, the Office of Science & Technology, 94-98 Petty France, London SW1H 9ST: Tel 0171-271-2052 and e-mail [steve.elton@osct.dti.gov.uk](mailto:steve.elton@osct.dti.gov.uk). Further information about the constitution, membership, role and current work programme work of the Council for Science & Technology is available on the Council’s website at the address ‘[www.cst.gov.uk](http://www.cst.gov.uk)’.