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THE RESEARCH COUNCILS' RESPONSE TO THE RECOMMENDATIONS OF THE TECHNOLOGY FORESIGHT INITIATIVE

DG Research Councils
Office of Science and Technology
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INTRODUCTION

1. The report of the Technology Foresight Steering Group, *Progress Through Partnership*, was published in May 1995. The 15 Technology Foresight Panels published their individual reports during April and May 1995. In anticipation of the publication of the reports the Research Councils began preparing their responses during 1994.

2. The following is a summary of each Council's proposed plan of action to take forward the Foresight findings now that all the reports have been published.

3. Annex A shows how these programmes map onto the eleven key topics described in *Progress Through Partnership* for each of the seven Research Councils.

BIOTECHNOLOGY AND BIOLOGICAL SCIENCES RESEARCH COUNCIL (BBSRC)

4. Following its establishment in April 1994, BBSRC adopted a working structure which reflected the call in the Government's White Paper, *Realising Our Potential* [Cm 2250], for the Council to be responsive to the needs of its users. The Council established three Directorates with the specific aim of developing and implementing policy to meet the needs of its three principal user communities: chemicals and pharmaceuticals; food; and agriculture.

5. For each of these Directorates the BBSRC established an Advisory Committee, chaired by an industrialist, with at least 50% user representation on the Committee. Over the past year, these Directorate Advisory Committees have set out to identify those areas where research is required to underpin the needs of the user community by conducting an extensive consultation with the user base, and through

correspondence and workshops. Throughout this period there has been a good interaction with the Technology Foresight Initiative, assisted by the extensive cross-membership between the Directorate Advisory Committees and Technology Foresight Sector Panels. For example, four members of the Food Directorate Advisory Committee are also members of the Food and Drink Sector Panel.

6. The emerging findings of Technology Foresight have, therefore, extensively shaped the strategic thinking of the Directorates. With the publication of the outcome of the Technology Foresight Initiative,the BBSRC intends to reorient its programme so that resources for strategic research underpin the following fourteen programme areas:

Strategic Programme	**Directorate**
Biomolecular Design	Chemicals and Pharmaceuticals
Applied Biocatalysis	
Environmental Biotechnology	
Bioprocess Engineering	
Cell Technology	
Analytical Technology	
Wealth Creating Products of Plants	Agriculture
Biological Responses to Stress	
Technologies for Improvement of Crops and Livestock	
Agricultural in the Environment	
Raw Material Quality	Food
Diet and Health	
Microbiological Aspects of Food Safety and Preservation	
Food Manufacturing	

7. These programmes take forward many of the priorities of the four Panels most relevant to BBSRC, as well as generic science and technology priorities identified by the Steering Group. The programme will be pursued through a variety of delivery mechanisms, including LINK, where BBSRC is already active in 13 programmes and is actively pursuing others. Not all research areas are at a stage appropriate for 50:50 funding with industry; nevertheless, some form of user involvement will be

encouraged in all the proposals considered within strategic programme areas and applicants will be invited to address at the outset possible exploitation routes. The Directorates will encourage team-working by specialists in different fields and this process will be promoted by programme managers seconded from industry wherever appropriate.

8. Both the Council's new Directorate strategic programmes and BBSRC's existing portfolio of basic research and training address the generic science and technology priorities and the generic infrastructural priorities identified by the Technology Foresight Initiative.

9. In relation to the science and technology priorities, BBSRC:

- has introduced a new bioinformatics research initiative jointly with EPSRC, with funding of £10 million over 4 years
- has existing initiatives in plant and animal genome analysis (funding for which has been increased by £3.6 million in 1995/96), and in plant molecular biology and which underpins genetics and biomolecular engineering
- has a new LINK programme which is contributing to sensors and sensory information process research
- will develop new applications on environmentally sustainable technology which will depend on greater understanding of molecular, cellular and physical processes and will be supported in BBSRC Institutes and by responsive mode grants
- has diet and health as a strategic priority of its Food Directorate and will continue to underpin this area through basic animal nutrition research in its Institutes and in universities

10. In relation to generic infrastructural priorities, BBSRC:

- is maintaining the skills base through strong studentship and fellowship schemes aimed at identifying the best supervisors, departments and research programmes

- is maintaining support for truly excellent research, whether or not in a Technology Foresight priority area, through the peer review process
- is providing incentives for multi-disciplinary research through workshops, coordinated programmes, Interdisciplinary Research Centres, research groups, Institutes, LINK programmes and joint programmes between Institutes and universities
- is providing incentives for universities to work with industry through LINK, ROPA, CASE, Teaching Company Scheme, equipment-with-industry initiatives and workshops between academics and industrialists

ECONOMIC AND SOCIAL RESEARCH COUNCIL (ESRC)

11. ESRC considers its response to the Technology Foresight Initiative to be one of its principal objectives. Planning began in late 1994 when the Council arranged a meeting with the Chairs of Foresight Sector Panels to gain an insight into the issues emerging from the Panels' discussions which would impinge upon the social sciences. In the Spring of 1995 ESRC organised a successful one-day seminar of all social scientists on Foresight Panels. On the basis of these discussions with the Panels, and an analysis of the Panel Reports, ESRC has carried out an internal review of the issues raised which are relevant to the Council's mission. The Council is now well advanced with an extensive and unique national consultation exercise aimed at specifying future priority themes that will not only meet the requirement of *Realising Our Potential* but also have a high level of scientific interest and legitimacy within the Council's academic community.

12. This consultation involves the following elements:

- eight detailed consultant reviews of the Council's existing portfolio
- in-depth interviews with key researchers and specialists

- the organisation of nine focused groups by a leading market research organisation to examine the major policy areas of the social sciences and involving groups of carefully selected users
- a detailed survey using a stratified sample of 600 users, divided into different areas of policy relevance
- written consultation with all the main professional associations and learned bodies in the Council's sphere of interest

All of these consultations have taken the outcome of the Technology Foresight Initiative as their basis.

13. ESRC has already developed the following provisional Council themes in response to the Foresight Initiative. These themes will be revised and extended substantially in July.

- Innovation as a Business Process
- Trade, Instability and the Changing International Order
- The Impact of Electronic Technology on Human Activities
- Social Exclusion and Social Integration

14. The following table sets out the way in which the Council's existing strategy already maps onto the recommendations of the Sector Panels.

TF RECOMMENDATION	ESRC PROGRAMMES
A. Understanding consumer behaviour and developing markets	Global Economic Institutions Programme Analyses ways in which existing international institutions respond to changes in the world economy Pacific Asia Programme Examines UK lessons to be learnt from Pacific Asian market mechanisms Single European Market Programme Analyses the problems and consequences of a single market Centre for Fiscal Policy Uses microeconomic and macroeconomic techniques in analysis of fiscal policy and its relationship to households and companies Economic Beliefs and Behaviour Programme Focuses on economic choices and how people make them Population and Household Change Programme Looks at crucial determinants of future markets in a changing demographic context Research Centre for Micro-Social Change in Britain Undertakes the British Household Panel Survey
B. Exploiting new technology	Programme on Information and Communication Technologies Explores the long term economic and social issues Media Economics and Media Culture Programme Analyses the media as competitive industries The Learning Society Programme Analyses the nature of knowledge and skills for employment in contemporary labour markets Cognitive Engineering Programme Researches design problems Human Communication Research Centre Focuses on the influence of language and speech on design of IT systems Centre for Research and Development Instruction and Training Tests and develops principles for the design of human and computer based teaching systems

TF RECOMMENDATION	ESRC PROGRAMMES
C. Regulating investment	Centre for Fiscal Policy (See A. above) The Risk Programme Studies the interrelationship between human behaviour and risk Pacific Asia Programme (See A. above) Global Economic Institutions Programme (See A. above) Centre for Economic Performance Addresses the impact of both the internal structure and organisation of trends, and the external market environment on output productivity and technical change Financial Market Centre Researches into the nature of financial markets and their links with the flow of savings and investments Contracts and Competition Programme Seeks to advance understanding of the problems, processes and outcomes associated with the growing use of contracts
D. Improving innovation organisation.	Centre for Business Research Analyses business organisation ESRC/DTI Intellectual Property Programme Studies the way in which a range of businesses used formal and informal systems for the effective management of knowledge assets Innovation Research Programme Focuses on innovative management Centre for Economic Performance (See C. above) Business Process Resource Centre Focuses on the analysis of business process and the dissemination of knowledge in this field
E. Managing environmental change	Global Environmental Change Programme Researches the causes of global environmental change Centre for Social and Economic Research on the Global Environment Focuses on the causes, consequences and policy implications of global environmental change NERC/ESRC Land Use Programme Develops new computer models Transport and the Environment Focuses on the interface between environment and society in terms of air quality and global warming Transport Study Unit Examines the causes, consequence, problems and solutions associated with traffic growth

TF RECOMMENDATION	ESRC PROGRAMMES
F. Organisation of the Science Base	ESRC/DTI Intellectual Property Programme (See D. above) European Context of UK Science Policy Programme Aims to provide research relevant to a range of research policy and management choices which the UK faces in the short and medium term

ENGINEERING AND PHYSICAL SCIENCES RESEARCH COUNCIL (EPSRC)

15. Fourteen of the 15 Sector reports make key recommendations of relevance to EPSRC, and at least 50 of the 76 recommendations relevant to EPSRC from Technology Foresight Sector Panels are already addressed within existing EPSRC programmes and activities. During the coming months, the Council will be discussing the outcome of the Foresight Initiative and expects to increase the convergence.

16. The EPSRC has put in place a mechanism to enable the outcome of the Technology Foresight Initiative to feed directly into its planning cycle. Following the completion of its recent planning cycle, the Council has published its research priorities and intentions for each of its programme areas. This document has been widely circulated to universities, institutions, professional bodies and Government Departments. There has been a very positive response to this. Feedback from recipients of the document will be used, with the Foresight reports, to provide input to the next planning cycle.

17. The Council will be considering the recommendations from the Technology Foresight Initiative at its June Council meeting. The Council's recommendations, together with the Foresight recommendations will then be examined by the Council's Technical Opportunities Panel and by the Users Panel. The advice from these Panels will be

discussed at the Council's December meeting. The outcome of this meeting will be the publication in the Spring of 1996 of the Council's new cycle of priorities.

18. The Council anticipate that the priorities identified in this 1996 publication will fully reflect the Technology Foresight recommendations and will clearly identify how the Council's priorities have changed since the 1995 booklet was published.

19. It is expected that one outcome will be the establishment of a research centre for one or more priority areas. Discussions have already begun with the Directors of the Interdisciplinary Research Centres so that the future requirement for such Centres can be identified. The Council hopes that this approach will release sufficient finance over the long term for the establishment of new Centres as earlier ones are modified, or closed.

20. The Council will consider several options for Centres. These will include the Interdisciplinary Research Centre concept, the Faraday concept and a number of mixed mode possibilities. The Council will, therefore, have a range of options available to respond to the recommendations of the Technology Foresight exercise.

21. The following table shows how some of the Council's current activities relate to the 11 key topic areas identified by the Technology Foresight Steering Group.

TF RECOMMENDATION	EPSRC PROGRAMMES
Telepresence, Multimedia	Initiative within multimedia networking applications with ITCS programme.
Bioinformatics	Subject of a jointly managed programme with BBSRC.
Genetics and Biomolecular Engineering	The joint Biomolecular sciences programme with BBSRC comprises the second largest element of the Chemistry programme.
Software Engineering	The systems engineering theme within the ITCS programme supports work across this area.
Management and Business Process Engineering	This is a central theme of both the Innovative Manufacturing Initiative and the Design and Integrated Production Programme.
Sensors and Sensory Information Processing	The Control and Instrumentation programme, with a budget of £5.6 million in 1995/96, provides a focus for this work. This is supported by initiatives across the Council's programme in Communications, Advanced Magnetics, Process Systems Engineering, and Analysis and Sensors.
Communications with Machines	The multimedia initiative, together with work within the human factors theme of the IT programme, covers much of this area.
Security and Privacy Technology	Encryption techniques are addressed in the Mathematics and ITCS programmes. Other aspects relating to the use of smart materials are part of the Materials programme.
Environmentally Sustainable Technology	The Cities and Sustainability initiative and the LINK Programme on Waste Minimisation Through Recycling, Re-use and Recovery in Industry within the Clean Technology programme, and work with the Electrical and Mechanical Engineering programmes on efficiency are all relevant.
Health and Lifestyle	The medical engineering theme within the Materials, the Biomolecular Sciences and Bioinformatics (joint with BBSRC) programmes and networking within the Information Technology programme are relevant.
Optical Technology	Linked initiatives in Optical Physics and Technology, Next Generation Laser Diodes, Microstructures and Photonic Materials are all relevant. There are also initiatives in Electronic Materials for displays, a LINK programme in photonics and the Optoelectronics Interdisciplinary Research Centre.

MEDICAL RESEARCH COUNCIL (MRC)

22. The MRC has been actively involved in the Technology Foresight Initiative. From late 1994, it began taking account of the emerging conclusions in its annual planning cycle. These have already had a substantial influence on the Council's Corporate Plan and Business Plan.

23. Following the publication of the final reports from the Technology Foresight Panels and from the Steering Group, the Council's Research Boards and Strategy Committee are reviewing the recommendations to formulate input to the next annual revision of the MRC's Scientific Strategy this autumn. The MRC Directors Conference in July will also review the Foresight findings and consider opportunities for MRC Institutes and Units.

24. Much of MRC's long-term basic and strategic research work already supports the priority areas highlighted by the Technology Foresight Initiative, including:

- Bioinformatics
- Genetics and Biomolecular Engineering
- Health and Lifestyle
- Risk Assessment and Management

The Council is also responding to specific opportunities identified for research, collaboration and application.

25. The Council has developed two new LINK proposals in Foresight Initiative priority areas. These are described in the following table.

TF RECOMMENDATION	MRC PROGRAMMES
Ageing Basic research into ageing and disabling degenerative disease, coupled with technologies for sustaining reasonable quality of life for the elderly and infirm.	Integrated Approaches to Healthy Ageing This programme aims to help develop integrated, deliverable, prevention, treatment and management methods which are based on sound biological, physiological, and sociological understanding. These will also be of benefit to the pharmaceutical, biotechnology and device manufacturing industries, and to the health and social service industries.
Genetics in risk evaluation and management Understanding how genetic information can be applied to preventing and treating common multi-factorial diseases.	Development of a Programme on Genetic and Environmental Interactions in Health This seeks to deploy the potential of the new molecular, cellular and genetic technologies and to enhance understanding of environmental mechanisms in health. By integrating these with genetic variation it will develop individually tailored approaches to diagnosis of risk and to prevention and treatment. There is increasing potential for collaboration with the diagnostics, biotechnology and pharmaceutical industries in developing these approaches.

26. In addition, the Council is currently pursuing with industry, the Health Departments, and other research funders, a range of collaborative developments which may be possible in the near term. These include areas such as:

- application of genetic and biomolecular engineering techniques to control of cell behaviour and cancer
- technologies for gene therapy
- genome sequencing
- genetic diagnostics - developing the know-how to move from theory to practice
- ageing
- brain repair

- developing twin registers as a tool for studying the genetic and environmental influences on an individual's health

27. These new programmes and projects, and the development of the Council's scientific strategy, are being taken forward in discussion with BBSRC, The Wellcome Trust, the Association of Medical Research Charities, the Department of Health and other funding agencies, to ensure effective coordination.

NATURAL ENVIRONMENT RESEARCH COUNCIL (NERC)

28. Following the publication of the White Paper and the establishment of new Research Councils, NERC was reorganised into a single Science and Technology Directorate with Science and Technology Boards advising Council on strategy. Each Board has representatives from the academic and user communities. As an integral part of their planning process, each Board is mapping its area of responsibility onto Foresight priorities. NERC also set up a new group the 'Technology Foresight Interaction Group', headed by a recruit from industry with a major focus on Foresight. The Council has been actively involved in discussion with all the Technology Foresight Panels. Although environment was the focus of only one of the Sector Panels, environmental issues are pervasive and have emerged as key elements in many of the Panels recommendations. A Cleaner World is one of the six SET priorities identified by the Steering Group.

29. The Council has already reoriented its thematic research programme around six key environmental issues, all of which are relevant to Foresight recommendations. These are:

    - resources
    - biodiversity
    - pollution
    - waste
    - risks and hazards
    - global change.

It has also developed a new scoring methodology to assess grant proposals submitted under this new thematic programme. The methodology takes into account the quality of the proposed science and relevance to user needs.

30. During 1995, NERC will launch a new programme related to Foresight priorities 'Environmental Diagnostics', with an emphasis on pollution and waste. Additionally, the Council is developing a bid for four new LINK programmes in the following topic areas relevant to Foresight priorities:

- earth observation
- sensors for the oceans
- remote sensing of the oceans
- enhanced oil/gas recovery

31. Certain key user groups had not contributed fully to the Foresight Initiative. NERC therefore commissioned its own parallel survey of 'user' needs from the Science Policy Research Unit. The objectives of this exercise were to:

- identify and provide a taxonomy of the Council's user community

- identify and develop a dialogue with key individuals in the user community with respect to environmental and natural resources issues and to identify cross-sectoral themes

- provide a platform for more detailed surveys of user needs to be conducted by the Council's Science and Technology Boards, either alone or in partnership where needs cut across the scientific remit of the Boards

32. The Council has established a Technology Foresight Implementation Group composed of members of NERC Council. The Group is composed of the Science and Technology Board Chairmen and representatives of the user community. It has reviewed the Council's existing science portfolio against the recommendations of the Technology Foresight Initiative and the outcome of the Council's own user survey.

33. Against the background of the Technology Foresight Initiative, NERC is conducting its own specialised foresight exercise. This has initially identified fifteen environmental themes from the Foresight reports and the Council's own user survey. These emerging themes relate to:

Industry - Environment Interaction

Improve understanding of the robustness of the environment to the impact of man's activities and the development of the means to access the whole life cycle environmental performance of new products and processes. Likely priority user sectors are chemicals, construction, manufacturing, materials, agriculture and energy as well as other high environmental impact industries.

Environmental Evaluation

Develop a methodology which brings together social and economic values of different aspects of the natural environment from the view point that the environment is a national asset. Likely priority user sectors are construction, high environmental impact industries, energy, environmental industry, SMEs and local authorities.

Land and Soil

Define and better understand the relationship between land use and soil processes to provide a basis for reducing and remediating adverse consequences of human behaviour. Likely priority user sectors are agriculture, leisure, chemicals and materials, retailing, insurance, local authorities, and those concerned with potential uses for brown land eg financial sector.

The Urban Environment

Develop an integrated analysis of the urban ecosystem. Likely priority user sectors are transport, construction, health, local and central Government.

Prediction of Extreme Atmospheric Events

Understand and predict extreme atmospheric events to aid risk reduction in affected areas of the economy, including, and for example, improved weather forecasting. Likely priority users are from planning and risk reduction groups in food, finance and insurance.

Mechanisms of Climate Change

Describe and understand the nature of climate change and predict the likely impact upon man and man's contribution to climate change. Sectors that have indicated an interest include transport and materials and those involved in land use.

Fluid dynamics in Natural Resource Management

Understand the interactions between fluids in the ground and rocks leading to, for example, increased recovery of oil and gas from know reservoirs. Likely user sectors are oil and gas, water and waste disposal.

Coastal Zone Modelling and Management

Develop predictive models for use in coastal zone management including coastal defences and coastal zone remediation. Likely priority user sectors include leisure, construction, transport and agriculture, and local authorities.

Structure and Properties of Earth's Subsurface

Improved imaging of the Earth's substructure with a view to improving the utilisation of subsurface resources including oil and gas. User sectors should include hydrocarbons, nuclear energy, waste and water.

Use of Natural Processes and Materials

Improved exploitation of naturally occurring materials, both inorganic and organic, as a basis for new drugs, adhesives etc. Likely priority user sectors are health, materials, manufacturing and environmental industries.

Sustainable Use of Marine Resources

Improved understanding of the relationship between marine life ecosystem stability and sustainable use of marine resources including wild fish populations. Likely user interests come from the food and Government sectors.

Ocean Circulation

Develop realistic ocean circulation models, to better understand the impact, dispersion and fate of pollutants. Likely priority user sectors include chemical and pharmaceutical, food, and there are interests from the electronics sector.

Remote Date Acquisition

Gather high quality relevant environmental data as a basis for modelling and predicting the environment particularly with respect to man's impact and improved management of environmental impacts. There are a wide range of sectors requiring good environmental data, of which the following have reinforced this need during the Foresight exercises: insurance, energy, leisure, and the environmental industry.

Social and Human Health Impacts of Environmental Change

Understand better the links between human health and the environment. Likely user sectors include local authorities, health, transport, leisure, high environmental impact industry.

Management of Freshwater Resources

Improve scientific tools for the sustainable management of freshwater resources including the supply of potable water. Likely priority user sectors include chemicals, manufacturing, extractive and water industries, and the environmental industry.

34. The Science Policy Research Unit are now assisting the Implementation Group to refine and prioritise these themes in terms of their attractiveness and feasibility. The process involves consulting over 100 key members of the NERC academic and user communities. At the same time the Council's present research programmes are being mapped onto the above Foresight themes.

35. The Implementation Group will then put forward their recommendations to the NERC Council relating to the extent to which existing NERC activities reflect Foresight priorities and identify any gaps in the programme where new research initiatives are appropriate.

36. It is intended that the findings of the Foresight Implementation Group will be incorporated into a new NERC Strategy Document to be published later this year. Additionally, recommendations relating to infrastructural requirements, such as the need to establish new capabilities to meet user needs and requirements for cross-Council working, will be made.

PARTICLE PHYSICS AND ASTRONOMY RESEARCH COUNCIL (PPARC)

37. Much of the Council's basic research is necessarily long term. Therefore the recommendations of the Technology Foresight Initiative are less likely to impact on it than that of most of the other Councils. However, to pursue such research requires access to the most advanced technology, for example detectors, high precision instrumentation, and pattern recognition systems. In these areas, the Council is keen to build on the Foresight recommendations to guide its industrial collaboration programme. The Council also recognises that the skilled workforce generated by its programme helps to provide the knowledge and skills base identified by the Foresight Initiative as a key infrastructural priority.

38. The Council played an active role in the Initiative itself with its research community involved in five of the Foresight Panels. PPARC will continue to maintain its involvement in the Foresight Programme and subsequent exercises, building on the networks already developed.

39. The Council's Industrial Liaison Panel, and Education and Training Committee will both target Technology Foresight recommendations for particular attention.

40. The Council has identified four key recommendations from the Foresight Panels which are of particular relevance to its areas of activity. These are:

- detector technology
- mathematical modelling
- high speed data handling
- image processing

41. Other important Foresight priorities in the PPARC area include:
    - advanced networks
    - optronics
    - satellite communications and communications security
    - electronic structural and high Tc materials
    - human-computer interface

42. PPARC's Industrial Liaison Panel has completed a preliminary analysis of the range of technologies developed in the Council's programme against the technology priorities identified by the 15 Panels. This analysis will be developed to help guide the Council's programme in support of academic/industrial collaboration and technology transfer. Specifically, this will help to prioritise the Council's own collaborative scheme - the PPARC Industrial Programme Support Scheme (PIPSS) - now in its second year, and the award of CASE studentships. The developments will be incorporated in the Council's next Business Plan.

43. The Council's Education and Training Committee will draw upon Foresight findings on infrastructural issues in developing PPARC's studentship and fellowship policy. As recommended by the Foresight Steering Group, the Council has already agreed to encourage women in science by abolishing all age limits for fellowships, thus removing a bar to their return to research work.

COUNCIL FOR THE CENTRAL LABORATORY OF THE RESEARCH COUNCILS (CCL)

44. The Council recognises that its multi-disciplinary research role will be important in the implementation of the Technology Foresight Initiative recommendations. In addition, the increasingly international nature of research, recognised by the Foresight Initiative, is an important aspect of CCL's research programmes.

45. The Council is able to offer strong support to technology across interdisciplinary boundaries and to provide synergy and added value through its national facilities. CCL programmes are strongly aligned with the delivery requirements of the Foresight recommendations which are being proposed by the Research Councils which it supports.

46. The Council has identified key areas from the Panel recommendations where it can make a significant contribution. These are:

TF RECOMMENDATIONS	CCL PROGRAMMES
Materials Development/Application Generic technology underpinning the range of industrial Foresight activities	Materials Research: CCL has substantial involvement and experience at the industry/academia interface in advancing the understanding of materials, their structure, behaviour and use through its large scale ISIS and SRS. The laboratory is also active in the rapidly growing field of surface science and the interaction of conventional and biological materials. CCL will deploy its technical capabilities in support of Technology Foresight programmes, in particular those of BBSRC, EPSRC and MRC.
Sensor Technology Sensors have been identified by more than half the Panels as having high priority and as a key technology for wealth creation	Sensor Development: This is a core activity for CCL since it is fundamental to accelerator based physics, earth observation by satellite, and laser research. Within the Council there is a massive body of sensor expertise supported by advanced fabrication and delivery capabilities for realisation of physical, molecular and chemical sensor devices. The Council will build on its existing capabilities to enhance its interdisciplinary mix of sensor, IT and communications expertise to align with Foresight recommendations.
Convergence of Information Technology, Electronics and Communication Identified as critical to future national prosperity	Information Science: The CCL is a national centre for high performance computing. It has one of the finest microstructure engineering facilities in Europe, world-class communications and opto-science skills, and a leading micro-circuit design group. Its systems-based approach offers strong support to new research and the onward application of existing techniques. It will be a critical resource in the successful implementation of Foresight recommendations.

Annex A

TECHNOLOGY FORESIGHT KEY TOPIC AREAS - RESEARCH COUNCIL RESPONSE

	BBSRC	ESRC	EPSRC	MRC	NERC	PPARC	CCL
TELEPRESENCE, MULTIMEDIA		✓	✓				✓
BIOINFORMATICS	✓	✓	✓	✓			
GENETICS AND BIOMOLECULAR ENGINEERING	✓		✓	✓			
SOFTWARE ENGINEERING			✓			✓	✓
MANAGEMENT AND BUSINESS PROCESS ENGINEERING		✓	✓				
SENSORS AND SENSORY INFORMATION PROCESSING	✓		✓		✓	✓	✓

	BBSRC	ESRC	EPSRC	MRC	NERC	PPARC	CCL
COMMUNICATING WITH MACHINES		✓	✓				✓
SECURITY AND PRIVACY TECHNOLOGY			✓				
ENVIRONMENTALLY SUSTAINABLE TECHNOLOGY	✓	✓	✓		✓		
HEALTH AND LIFESTYLE	✓	✓	✓	✓	✓		
OPTICAL TECHNOLOGY			✓			✓	✓

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