

Research in the UK

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Science & innovation
investment framework
2004 - 2014

July 2004

**Science and innovation
investment framework 2004-2014:
next steps**

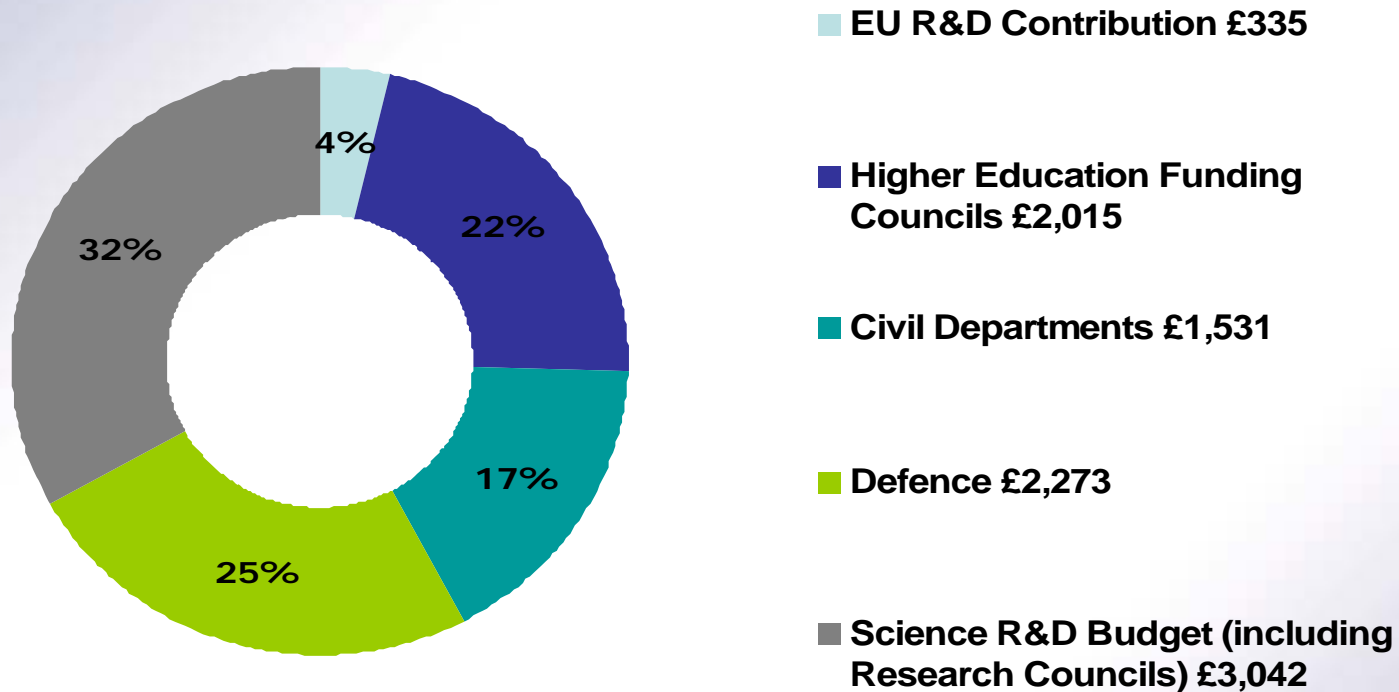
March 2006

**Long-term opportunities and
challenges for the UK:
analysis for the 2007
Comprehensive Spending
Review**

November 2006

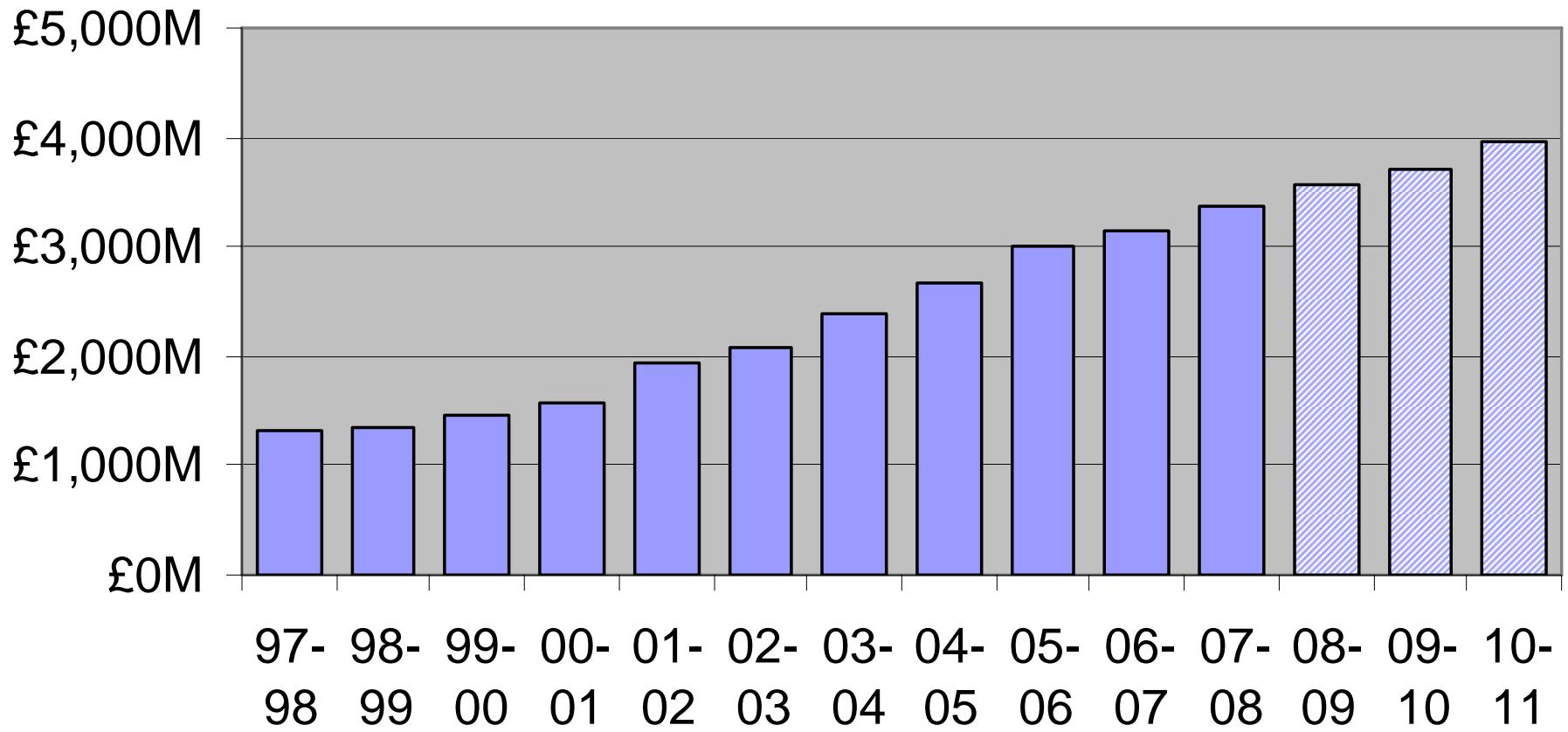
Government Funded R&D

Estimated 2007-08 Net UK Government R&D Expenditure (£m)



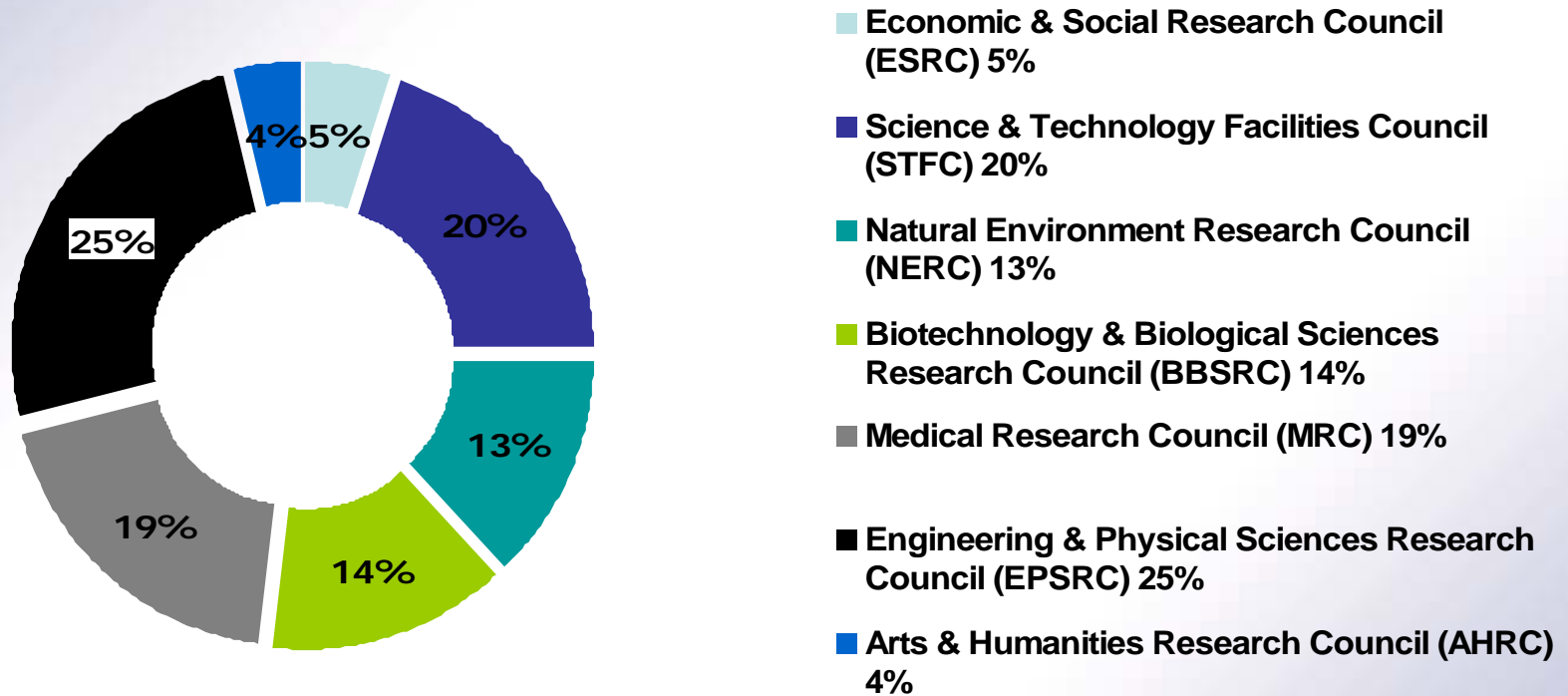
Source: Department for Business, Enterprise & Regulatory Reform; Science, Engineering & Technology (SET) indicators
Estimated 2007-08 Net UK Government Expenditure on R&D in real terms.

The Science Budget



Science Budget Allocations

Estimated 2007-08 Net UK Government R&D Expenditure



Total £2,833 million



Source: Department for Innovation, Universities and Skills (DIUS)



Arts & Humanities
Research Council



Engineering and Physical Sciences
Research Council



Science & Technology
Facilities Council



DIUS
Science and Engineering Group

Research Councils UK

BBSRC

ESRC

EPSRC

MRC

NERC

STFC

AHRC

SPECIFIC MISSIONS BUT COMMON OBJECTIVES

- Support basic, strategic and applied research
- Support postgraduate training and research career development
- Advance knowledge and technology and provide services and trained people that lead to social, cultural and economic impact
- Manage and develop large facilities
- Promote science in society
- Maximise the impact of investments on the economy, public policy and services, and culture



WORKING TOGETHER

- To increase impact and influence
- To provide more effective and efficient services
- To ensure that individual Councils sustain strong ties with communities and provide leadership



HOW DO WE DO IT?

- Training researchers
- Research
- People flow
- Commercialisation

Training

Currently fund 15,500 PhDs students.

A third gain research experience with a non-academic partner.

Around 40% from overseas.



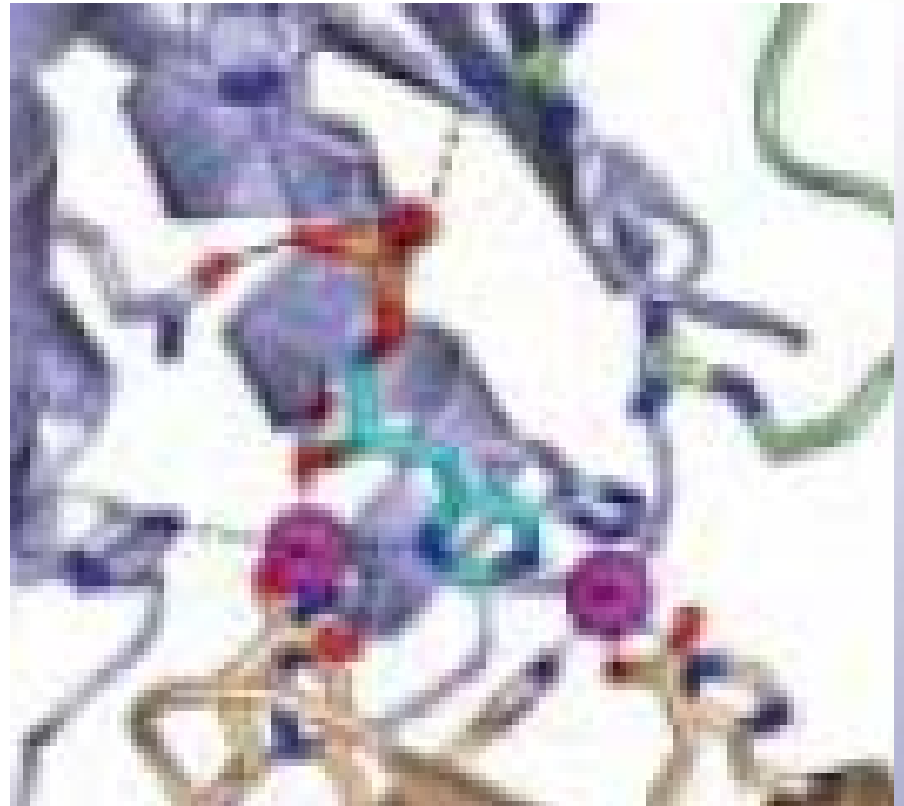
People flow

One of the most effective forms of knowledge transfer:
Industry fellowships;
interchange schemes;
knowledge transfer partnerships



Research

Next year we expect to spend £3000 million on research, some (£230M) with users, eg Rolls Royce, Reebok, government



Commercialisation

Fostering
entrepreneurial
culture;

Incubators;

Exploitation
companies – CLIK,
MRCTechnology



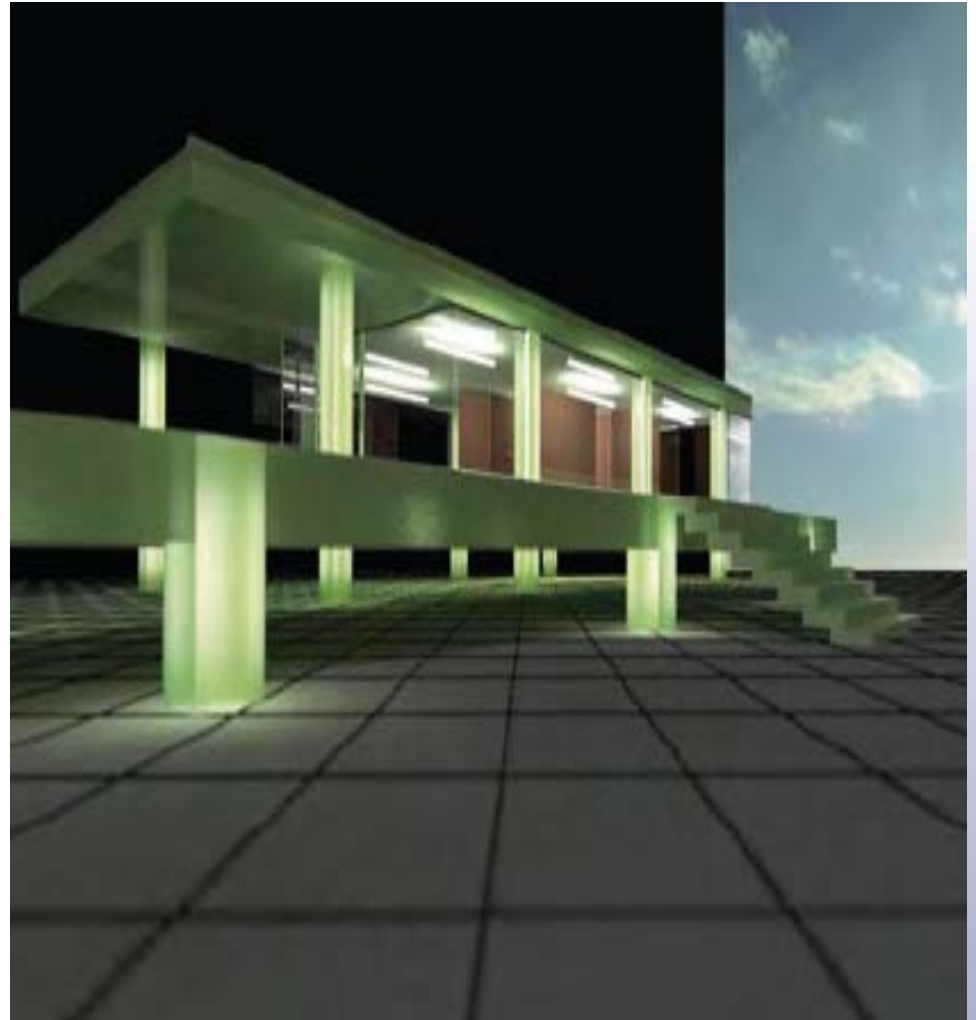
Biological Sciences

Transgenic hens that produce complex medicinal proteins in egg whites: human interferon or treatments for malignant melanoma.



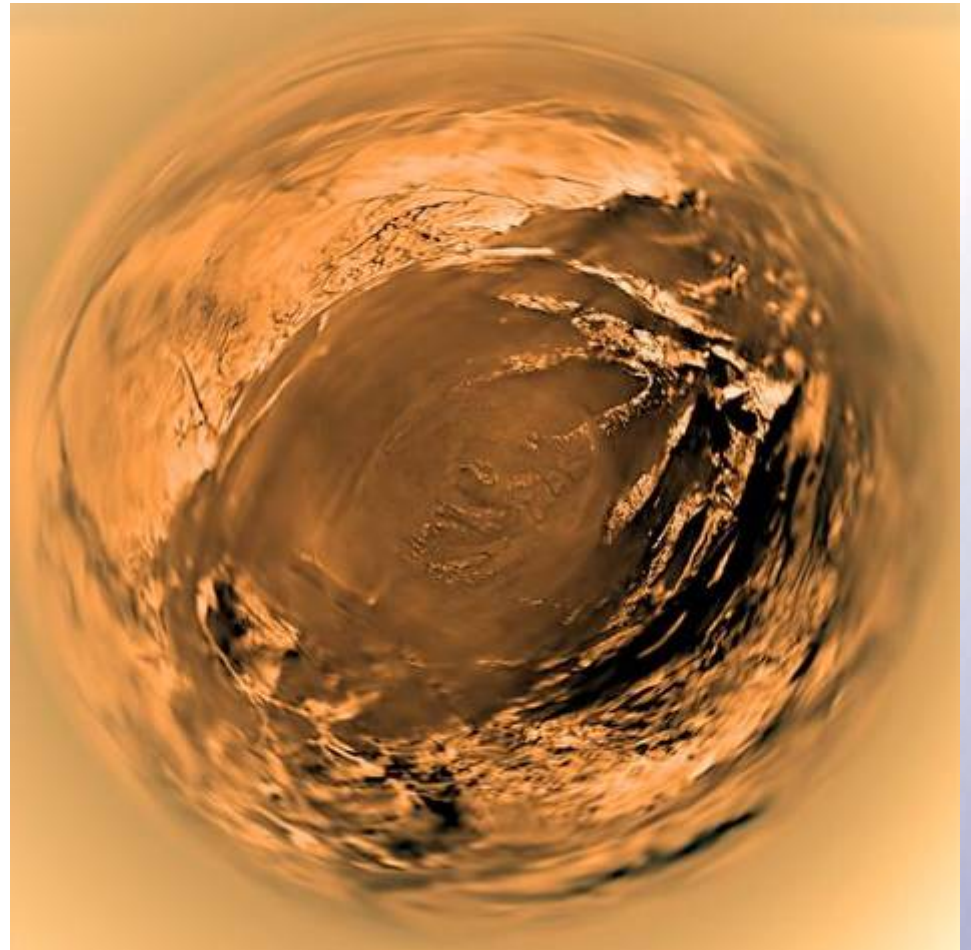
Arts and Humanities

New structural material created from recycled bottle glass. Winner of the International Design Resource Awards in 2001 and 2003.



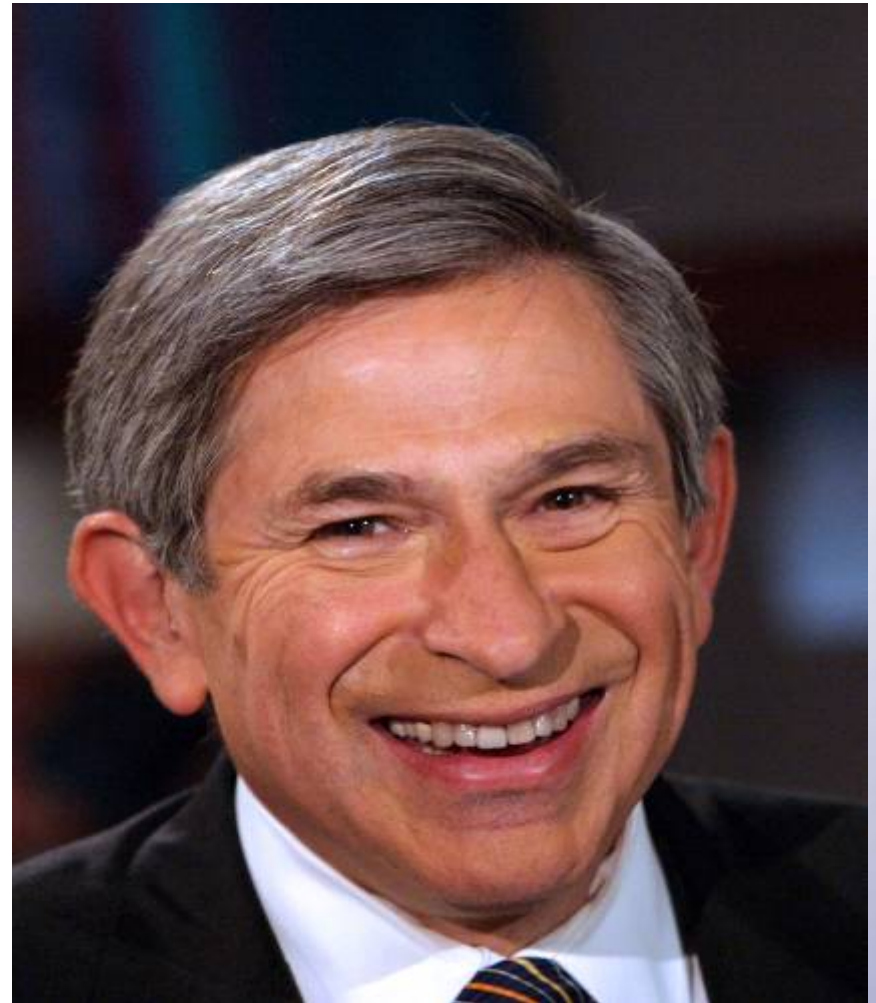
Astronomy

The Huygens mission to Titan led to the development of a system for managing complex management projects.



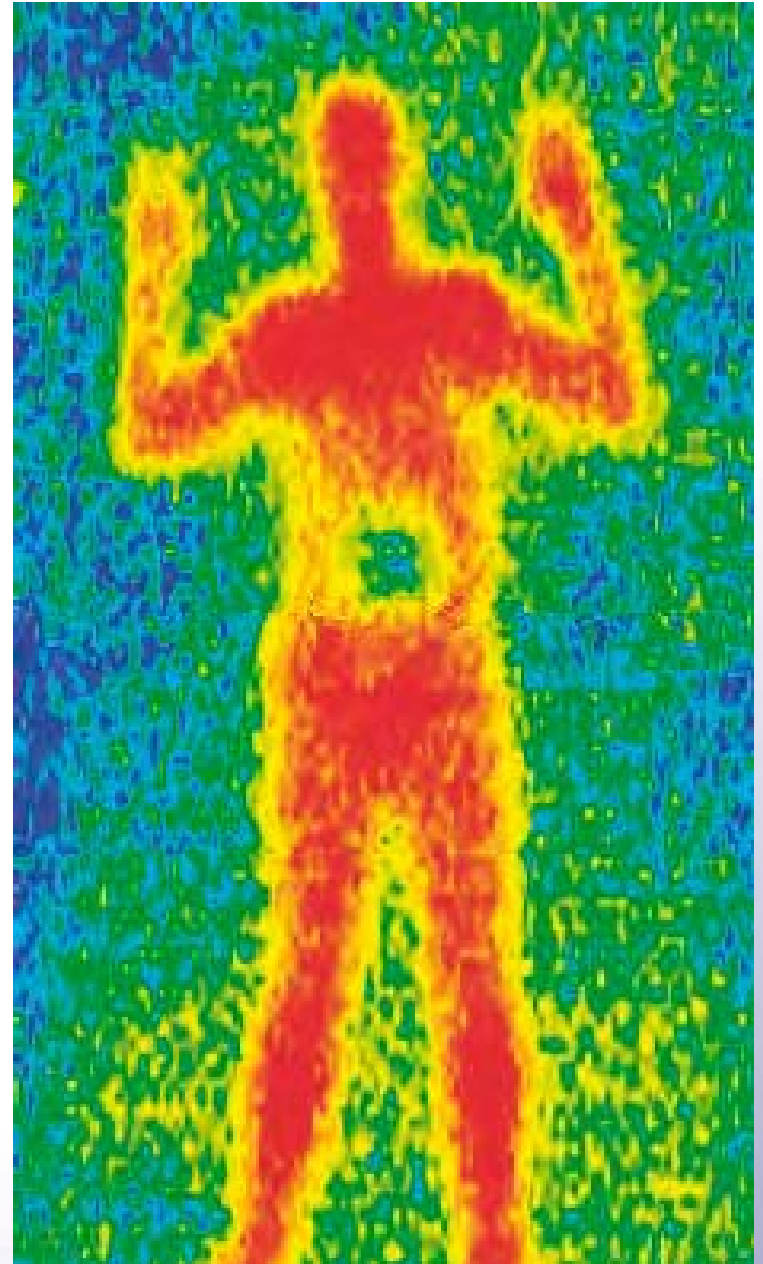
Economics and social science

The World Bank is using ESRC results to advise governments on R&D tax credit schemes.



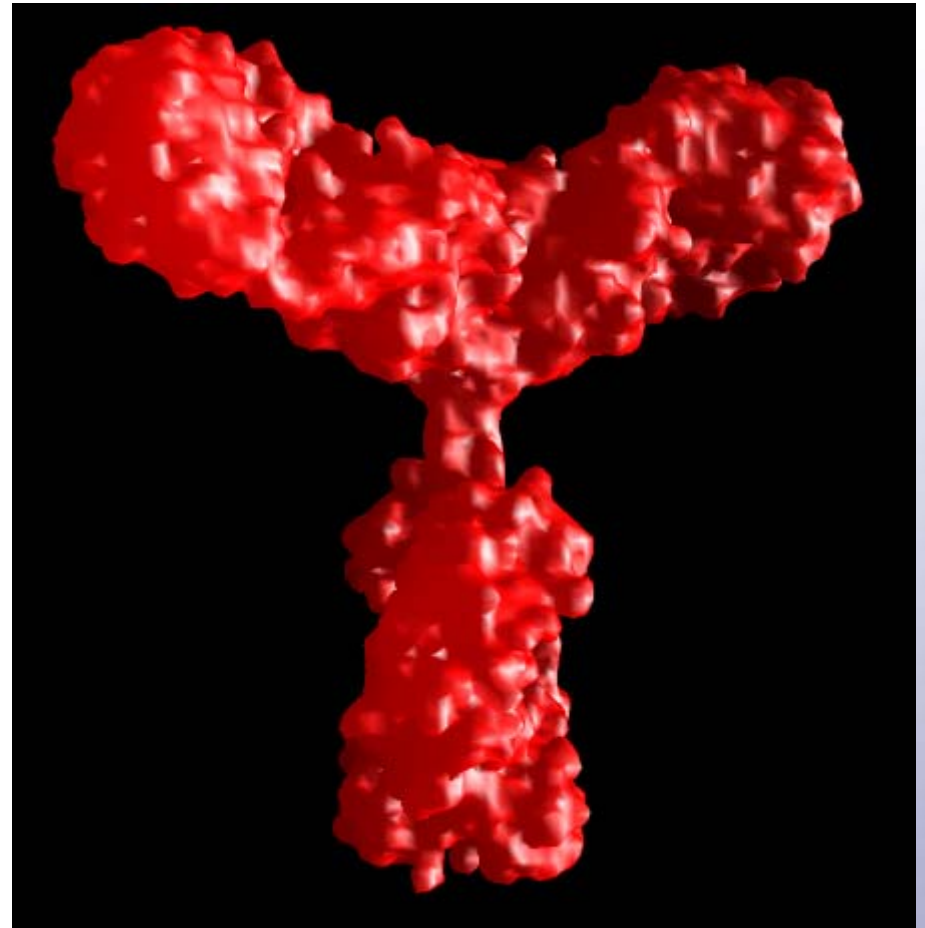
Engineering and Physical Sciences

From the emerging science of terahertz waves, a company has developed a range of security screening products for imaging concealed contraband and threat objects on people at a distance.



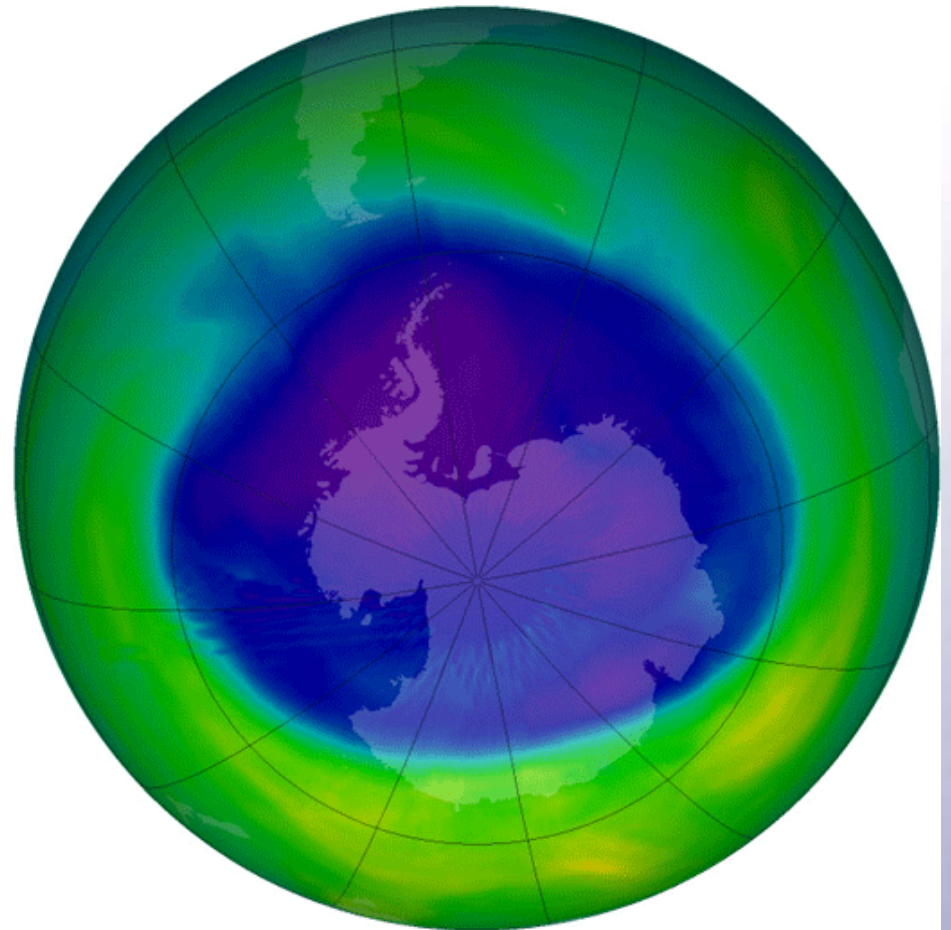
Medical Sciences

‘Humanised’ or fully human monoclonal antibodies: 11 therapeutic antibodies already marketed and 58 in late stage clinical trials.



Environmental sciences

Discovered of the ozone hole in the southern hemisphere and provided some of the science to underpin the development of the Montreal Protocol.



WHERE DO WE UNDERTAKE RESEARCH?

- Higher education institutions (75% funding to 25 institutions) supporting around 30,000 researchers
- Research Council institutes (four RCs) employs around 9,000 scientists and technicians
- Independent research organisations
- International ventures (eg CERN)



THE EXPANDING ROLE OF UNIVERSITIES

- UK science is world class and improving
1% population, 9% publications, 12% citations

But also

- increasing numbers and success of business start ups, and licensing arrangement

And

- becoming the engine for innovation and economic growth

STATUS OF UK RESEARCH

- Bibliometric data

(2nd worldwide, most productive in G8, first in the world on impact for health and biological sciences)

- University rankings

(Times Higher – 7 in world top thirty)

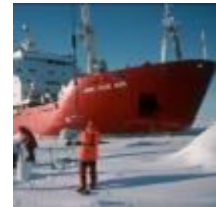
- ERC starter grants

(19% of grant-holders in UK, half from overseas)



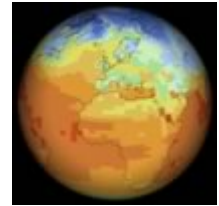
DUAL SUPPORT

- Globally admired
- Balance of retrospective and prospective funding
- Balance of block and project funding
- Stability with incentives



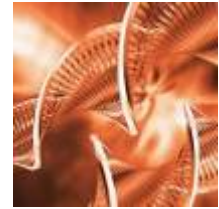
HOW DO RESEARCH COUNCILS ADD VALUE?

- Peer review
- Strategic oversight
- Promote and enable collaboration
- Sustainability



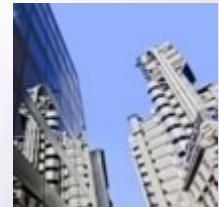
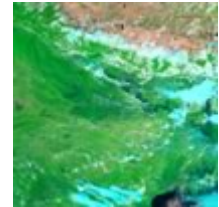
PEER REVIEW

- Gold standard – international benchmark
- Integral part of the development of research
- Minimise burden on research community (efficiency and effectiveness)



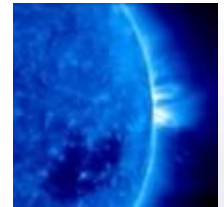
STRATEGIC OVERSIGHT

- Health of disciplines (subject reviews, eg physics)
- Capacity building
- Align public policy priorities and user requirement



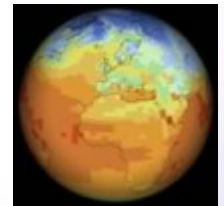
STIMULATE COLLABORATION

- Between disciplines – removing obstacles, providing incentives
- Between institutions – stimulate networks, nurture community
- Between nations – RCUK Offices (Europe, China, USA, India)



SUSTAINABILITY

- Research now funded using full economic costs. (Alexander Review late 2008)
- Skills and career support – ensuring that UK research base has the numbers with the right skills (eg entrepreneurship, outreach)
- Long term planning/commitments
 - Large Facilities Roadmap



ALIGNING WITH PUBLIC POLICY

- Cross-Council programmes with impact embedded
- Relevance to CSR challenges
- Realising Britain's Potential: Future Strategic Challenges for Britain
 - Economic Prosperity
 - The Population Picture
 - Safe Britain
 - The Climate Challenge
- Strong track record, eg Rural Economy and Land Use
- Globalisation – links with UKTI, collaboration with emerging economies
- Future themes: food security?



Major Cross-Council Research Programmes

PRIORITY RESEARCH THEMES

- Energy
- Living With Environmental Change
- Global Uncertainties: Security For All in a Changing World
- Ageing: Life-Long Health and Wellbeing
- Digital Economy
- Nanoscience through engineering to application



ENERGY

- £319 million commitment by Research Councils over CSR period (2008-2011)
- Support world-class research and postgraduate training to position the UK to meet its energy and environmental targets and policy goals.
 - Tackling climate change by reducing carbon dioxide emissions both within the UK and abroad
 - Ensuring secure, clean and affordable energy supply.
- Closely aligned with Living With Environmental Change



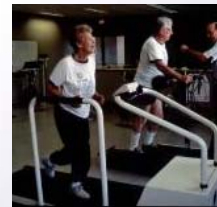
ENERGY

- Examples
- £50 million investment in internationally leading research consortia including wind energy, marine energy, next generation photovoltaics, hydrogen, electricity distribution networks.
- £12 million research in nuclear power technology, waste management and sustainability £4 million engineering doctorate for nuclear skills.
- £20 million UK fusion programme plus partner in ITER
- £14 million investment in UK Energy Research Centre whole systems energy research and input to policy.
- £3 million consortia in behavioural aspects of demand reduction
- £10 million strategic partnership with E.ON
- £6 million collaboration with China on renewables.



AGEING: LIFE-LONG HEALTH AND WELLBEING

- Research Councils are investing £485 million over CSR period in ageing research with input from all seven Councils.
- By 2051 40% of the UK population will be over 50 and one in four will be over 65
- Cultural understanding that foundation for good health and wellbeing is laid in early years but even at the oldest ages individual choices can influence health and wellbeing
- Economic and social gains associated with healthy ageing and reducing dependency and disability in later life
- Changes in public policy and development of services and technologies to support independent living



AGEING: LIFE-LONG HEALTH AND WELLBEING

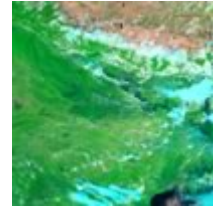
- **Examples**

- Basic research on ageing trajectories and minimising or reversing functional motor and cognitive decline
- Lifecourse factors and experiencing older age - developmental sciences, early origins of optimal health, identities associated with older age, measures of quality of life
- Ageing as a risk factor underlying health, frailty and disease in later life
- Assistive technologies within the home and workplace, tools and methods
- Economic, including personal financial factors affecting autonomy
- Creativity: access to the arts at different stages of life and the relationship with wellbeing



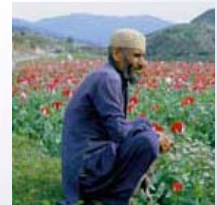
LIVING WITH ENVIRONMENTAL CHANGE

- **10-year programme:** £363 million over CSR period
- **Addresses:** environmental change issues raised by Stern Review, UN Millennium Assessment and Treasury Challenge 5
- **Focus:** information and solutions to manage and protect vital ecosystem services; foresight at the time and geographic scales business, government and regions can use
- **Economic impact:** new mitigation and adaptation approaches and technologies, keener insurance market, fewer premature deaths, better pest and disease control, sustaining food supplies
- **Partnership:** 6 Research Councils, 9 Government bodies and Met Office Hadley Centre



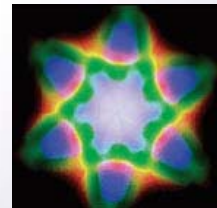
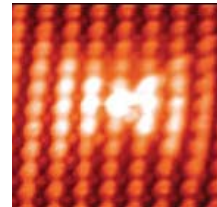
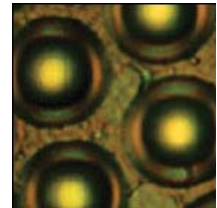
GLOBAL UNCERTAINTIES: SECURITY FOR ALL IN A CHANGING WORLD

- Integrates research in crime, terrorism, environmental stress and global poverty, to address causes of threats to security, their detection, and possible interventions to prevent harm.
- Research Councils working together to address four inter-related global threats to security – crime, terrorism, environmental stress, and global poverty, each linked to address three themes - £113 million over CSR period.



NANOTECHNOLOGY THROUGH ENGINEERING TO APPLICATION

- £50 million investment over CSR period by six Research Councils
- Research community to be set a series of Grand Challenges – each one addressing an area of societal importance.
 - Harvesting solar energy is the first.
- Public engagement programme to debate concerns, explore the ethical and social implications and clarify the benefits of nanotechnology.



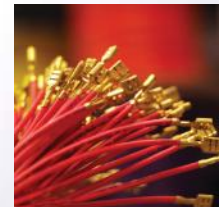
THE DIGITAL ECONOMY

- £58 million investment over CSR period
- ICT is embedded in all areas of life and it is constantly evolving. It has the ability to transform how business operates, the way government delivers and the way society interacts.
- Programme will link world-class ICT research with other scientific disciplines, business and the needs of end users. This will create a multidisciplinary, user-focussed, research base capable of responding



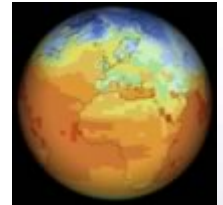
THE DIGITAL ECONOMY

- Concentrate initially on areas where capture management and presentation of information can have the maximum impact:
 - healthcare, transport and the creative industries.
- Five IT-centric interdisciplinary research centres have already built a strong research base engaging social scientists, clinicians, psychologists, biologists, designers, artists and film makers.



RCUK IMPACT MISSION

- To advance knowledge, understanding and technology, and provide trained researchers;
- To build partnerships that enhance take-up and impact, thereby contributing to the:
 - economic competitiveness of the United Kingdom,
 - effectiveness of public services and policy, and
 - enhancement of the quality of life and creative output of the nation.



*derived from the Royal Charters of the Research Councils

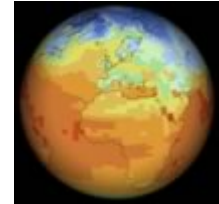
EXCELLENT RESEARCH WITH HIGH ECONOMIC IMPACT

- Delivered through:
 - Multidisciplinary research programmes
 - Partnerships
 - Business processes (e.g. peer review)
 - Consistent message to research and user communities
 - Understanding and demonstrating impact



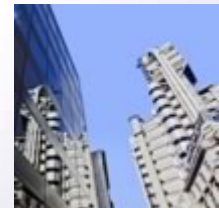
STRENGTHEN INNOVATION CAPABILITY

- Align research and exploitation capacity
 - Science and innovation campuses
 - Coincidence of research and KT investments
 - Address innovation gaps
 - KT to accelerate and increase likelihood of economic impact
- Enterprise culture
 - Provide incentives, rewards and recognition
 - Promote role models – entrepreneurs and leaders
 - Equip researchers with whole-life and enterprise skills
 - Career interchange/sabbaticals
 - Understand career trajectories and mobility



PIVOTAL ROLE OF USERS

- Increase the scale, breadth, and richness of user interactions with the research base
 - New collaborations, new sectors, global R&D, SMEs
 - Beneficiaries of knowledge, skills and capability
 - Secure and accelerate economic impacts
- RCUK more responsive and receptive to users
 - User perspective embedded in every aspect of RCUK business
 - Build alliances
 - Leadership, influence, advocacy



DEMONSTRATING ECONOMIC IMPACT

RCUK Economic Impact Study

- Evaluation of 18 case studies
- Broad (“Treasury Green book”) interpretation of impact
- Published 14 October 2007

Looking forward

- PhD cohort study
- Output and outcome reporting
- Origin of spinouts (with UNICO)
- Quantifying benefits to users
- Policy impacts
- International benchmarking
- RCUK capabilities e.g. data, MIS, methodology, economic analysis, performance management



CELEBRATING SUCCESS



> IMPACTS
SUCCESSES FROM UK RESEARCH

UNICO
Universities UK
RESEARCH COUNCILS UK



> IMPACTS
SUCCESSFUL COLLABORATIONS WITH
SMALL AND MEDIUM SIZED ENTERPRISES

RESEARCH COUNCILS UK

RCUK EXPECTATIONS FOR SOCIO-ECONOMIC IMPACT

- publish results widely: both academic, user and public audiences
- exploit results to secure social and economic return to the UK
- manage collaboration professionally
- staff and students develop skills matched to the demands of their future career paths
- curation, management and exploitation of data for future use
- work in partnership with The Research Councils