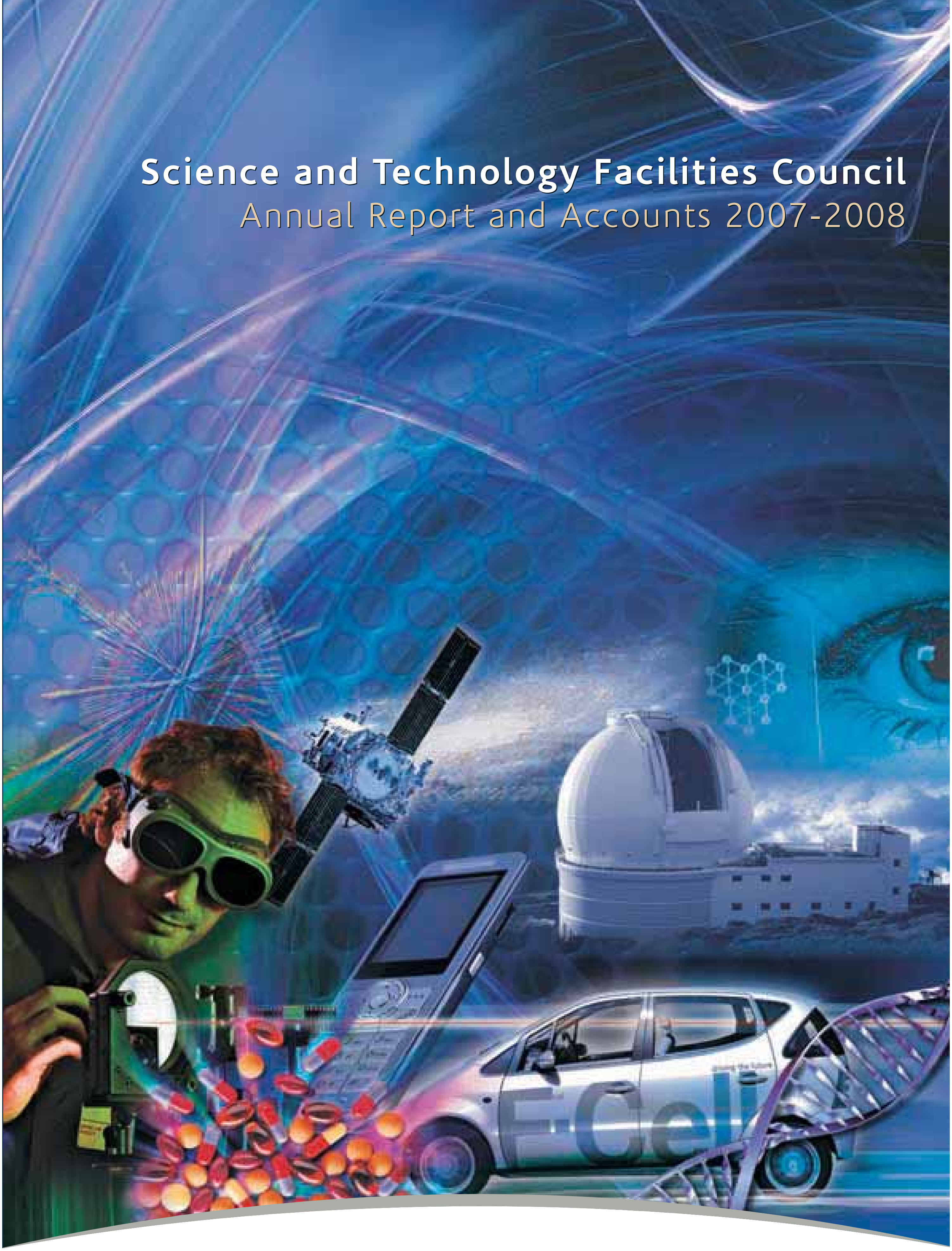
Science and Technology Facilities Council
Annual Report and Accounts 2007-2008



Science & Technology Facilities Council

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Annual Report and Accounts 2007-2008

Science and Technology Facilities Council (STFC)
Report and accounts 2007-2008

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Mission statement

A science-driven organisation, the Science and Technology Facilities Council (STFC) enables a broad range of scientists to undertake world class research tackling some of the most fundamental scientific questions.

The STFC's mission, as set out in the Royal Charter, requires the Council to:

- promote and support high-quality scientific and engineering research by developing and providing, by any means, facilities and technical expertise in support of basic strategic and applied research programmes funded by persons established in the United Kingdom and elsewhere;

- promote and support, by any means, high-quality basic, strategic and applied research and related post-graduate training in astronomy, particle physics, space science and nuclear physics and research in any other field which makes use of scientific facilities where access is provided, arranged or otherwise made available by the Council, having regard to the objects of the other research councils, and;

- promote and support the advancement of knowledge and technology (including the promotion and support of the exploitation of research outcomes) and to provide trained scientists and engineers, and thereby to contribute to the economic competitiveness of the United Kingdom and the quality of life of its people, meeting the needs of users and beneficiaries.

The council is also charged to:

- generate public awareness;
- communicate research outcomes;
- encourage public engagement and dialogue;
- disseminate knowledge; and
- provide advice.

Formed on 1 April 2007, upon the merger of the former Council for the Central Laboratory of the Research Councils (CCLRC), the Particle Physics and Astronomy Research Council (PPARC) and the Engineering and Physical Sciences Research Council's (EPSRC) Nuclear Physics Programme, the new Council is much larger than you may expect. The STFC has an extensive science research portfolio. Facilities and expertise are utilised by universities, research institutes, industry and government agencies around the world to advance knowledge of the Earth, the Universe and life itself.

This report, which covers the first year of the Council, aims to provide a brief overview of the STFC's wide ranging activities and an insight into the invaluable benefits gained through the UK's investment in world class science and technology.

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Foreword

I am pleased to present this first Annual Report of the Science and Technology Facilities Council (STFC). When I agreed to be Chair I looked forward to the opportunity afforded by the creation of the STFC to help strengthen the capacity of the UK research base to deliver world class science and to increase economic impact through the science, the technologies and above all the people we support.

A year on, I am even more enthused by the breadth and the exceptional quality of the research which the STFC is supporting. We are enabling researchers both in universities and industry to tackle a wide range of research problems from the most fundamental, which could radically change our view and understanding of our world, to those which have the potential to be of real social or economic benefit in the relatively near term.

This report highlights many examples of this research using our current suite of facilities. These include: the search for very small cool stars, brown dwarfs, which will give us important clues to how stars formed and galaxies evolved; experiments to understand why there is more matter than antimatter in our universe; the potential use of magnetic nano-particles as a vehicle for the targeted delivery of drugs into cells; the application of Grid-based computing to improve the diagnosis and treatment of heart failure and cancer; and the potential discovery of a new class of materials which could bring us a step closer to solving the problem of hydrogen storage.

These advances owe much to the technologies which have been developed through collaborations between researchers and technologists in universities and in our laboratories and we are building on knowledge exchange vehicles developed in CCLRC and PPARC to effect even greater technology transfer.

An excellent example of this process is the development of Spatially Offset Raman Spectroscopy. This technique promises to have a wide range of applications including non-invasive detection of liquid explosives, better quality control of the production of pharmaceuticals and foodstuffs, and the detection of diseases through soft tissue. It was developed in close collaboration between researchers and our knowledge transfer arm CLIK and is being commercialised through one of our spin-out companies, LiteThru Ltd.

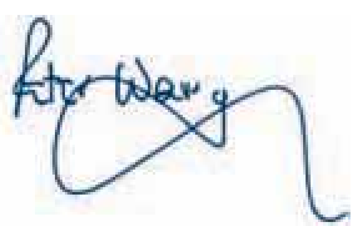
We must exploit more of these opportunities and here the development of the Daresbury and Harwell Science and Innovation Campuses are a crucial element of our strategy bringing together university groups, companies and the expertise which supports our national facilities to create an environment in which science and innovation can flourish. The demand from high-added value science based companies to locate on the Daresbury Science and Innovation Campus continues to grow and we are well advanced in setting up the joint venture company for the Harwell Science and Innovation Campus, which is attracting considerable interest from multi-national organisations as well as universities.

In December 2007 we published our Delivery Plan setting out our priorities for the next three years within our financial allocation from the 2007 Comprehensive Spending Review (CSR07). This plan will enable the UK to be involved in the development of some of the most exciting

research projects into the next decade as well as exploit our current facilities. As my Council made clear when we published the plan it is not without risk. To ensure we have a healthy and financially sustainable programme moving forward we are in the process of finalising a reprioritisation of the programme and have set some challenging targets for efficiency savings within our laboratories over the next three years. Our plans for achieving these targets are now well advanced. Other risks remain, for example, the potential impact of the current weakness of the pound, which is especially pertinent since much of our programme is international. We will continue to work with the Department for Innovation, Universities and Skills (DIUS) to ensure these risks are actively managed.

My Council and I are conscious that some of the choices we made and the processes we used to make them have been of concern in parts of our research community and have been scrutinised by the House of Commons Select Committee on Innovation, Universities, Science and Skills. We recognise that there is a need to improve how we consult and communicate with all of our stakeholders; plans are being implemented to tackle this important issue. I believe it is in the interests of all who share our ambition to improve the competitiveness and value, actual and perceived, of the UK science base that we enable discussions on how this ambition can best be achieved.

The inspirational value of the international science and technology enabled by the STFC is immensely powerful. Through the provision of wide-ranging staff development and research, studentship and fellowship grant schemes, the Council is a major provider of trained scientists and engineers for UK plc. The mixture of world class science and discovery delivered by the STFC is also stimulating an excellent programme of engagement with young people, enthusing and encouraging future generations of scientists to develop their skills and knowledge of the world around us and solve the major challenges facing society.



Mr Peter Warry FREng
Chairman

Introduction

Let me first echo our Chairman's excitement about the ambitions we share for the Science and Technology Facilities Council (STFC) and the opportunity to contribute to the UK research base, the economy and society at large. To sustain science of the highest quality it is crucial that we invest in new state-of-the-art facilities in which we are a major stakeholder or will run on behalf of the UK and, in some cases, international partners.

This year several significant milestones have been achieved. In October 2007, Her Majesty the Queen officially opened the Diamond Light Source, which in its first year of operation is already demonstrating its huge potential from the results from its first seven commissioned beamlines. The Large Hadron Collider at CERN is in the final stages of construction with the completion of the assembly of the main detectors which are now being commissioned. In December 2007 the first protons were transferred down the beamline to the new second target station for ISIS. This year also saw the delivery of SCUBA-2 to the James Clerk Maxwell Telescope in Hawaii and the commissioning of Astra Gemini, the world's highest intensity laser. Indeed, reviewing the programme milestones we set for the first year of the Council in our 2007-2008 Delivery Plan, 94% were achieved and most of the remaining 6% are due to short-term delays given the very high gain, high risk research and development which is at the heart of our science.

Our plans moving forward, as set out in our Delivery Plan for 2008-2009 to 2010-2011, are equally ambitious. We want to ensure that the UK is active in leading future developments internationally across our programme. For example, UK expertise based at Jodrell Bank is leading on the European research and development programme for the Square Kilometre Array and, similarly, a team from the Central Laser Facility at the Rutherford Appleton Laboratory is leading on the development of HiPER, dedicated to demonstrating the feasibility of laser driven fusion as a future energy source. As part of this process of positioning the UK for future large scale facilities, we have been actively involved with the other Research Councils in developing the RCUK road-map and in deciding priorities for investment over the next three years.

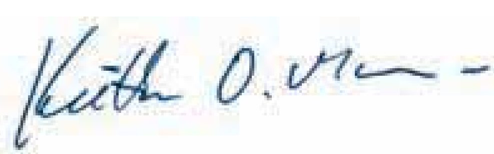
One of our priorities is the development of a suite of 'Technology Gateway Centres'. These centres of excellence in the UK will provide state-of-the-art support in key areas of science and technology which are needed across the research base. We are planning to create five Centres in the areas of imaging, high performance computing, materials, detectors and space technology which will be based at the Daresbury and/or Harwell Science and Innovation Campuses.

In taking these plans forward, and to take advantage of new ideas and opportunities that will keep our programme at the cutting-edge, it will be necessary to shift investment away from some current programmes. As recipients of taxpayers' money, we have a duty, like our fellow research councils, constantly to ensure that we invest our funds where they will have maximum impact. The aim of the programmatic review which we initiated in the autumn of last year, and we plan to repeat every two years, is to help us assess the optimal balance between investing in current programmes or facilities

and new initiatives. In providing advice I believe the new science advisory structure which we set up has done a very good job. We recognise that there is scope for further improvement and this structure must be supplemented to ensure that our broad research constituency has the opportunity to give its views on our overall science and technology strategy, which sets the context for each programmatic review, and that we build more consultation into the process of the review itself. It is also clear that we need to develop our processes for engaging with stakeholders more broadly in shaping our overall corporate strategy and in deciding how best to develop our plans to achieve even greater scientific competitiveness and economic impact. These changes will be implemented next year.

There is also a requirement to ensure that the STFC is effectively geared as an organisation to deliver the ambitious programme we set out to achieve. The success of mergers invariably depends on having a clear sense of direction, a coherence of purpose and cultural values, and the right expertise and business processes in place to deliver. We have not made as much progress on this as we would have wanted in the last year and we need to accelerate a programme of change. To enable us to identify the key areas in which improvement is needed we will carry out an organisational review in the first half of 2008-2009.

Finally, may I commend this report to you which illustrates the exceptional world class science and technology delivered through the STFC and the wide-ranging opportunities there are to achieve even more. Indeed, reading through the Council's achievements over its first year, is manifest that the potential for translation of the UK's investment in science into tangible social and economic benefits is immense.



Professor Keith Mason
Chief Executive

Sustaining the UK's economy and the promotion of broad-based growth requires effective policies to support research, innovation and access to advanced expertise and technologies

Indeed, the growth of economies throughout the world has been driven largely by the pursuit of scientific understanding, the application of engineering solutions, and continual technological innovation. The execution and exploitation of world class research not only increases our knowledge of the world around us, it also addresses key problems facing society, giving rise to new industries, new jobs and a higher standard of living.

The STFC plays a major role in enabling and performing world class research, and providing a strategic focus so that the UK can sustain world leading capabilities in key areas of scientific research and technology and exploit the results to the benefit of the UK economy and society. The Council's primary goal is to sustain and build on the relative strength and international competitiveness of the various research communities through:

- provision of support for the astronomy, nuclear physics, particle physics and space science and exploration research communities, both through grants to universities and access to state-of-the-art facilities both nationally and internationally;
- provision of access to large-scale facilities and services, again both nationally and internationally, required by the research communities of all the research councils;
- operating effectively facilities under our managerial control and exerting influence, commensurate with the STFC's stake-holding, on the operational effectiveness of facilities run by others;
- investment in cutting-edge technologies, in university groups, the Council's laboratories and industry, which will deliver step changes in science capability and enhance STFC's credibility as international partners of choice;
- provision of sufficient trained people to sustain the Council's capacity to compete, addressing particular areas of skill shortage;
- provision of adequate sustainable infrastructure both in universities and STFC's laboratories; and
- promotion of cross-fertilisation of ideas across disciplines by developing new multidisciplinary approaches to science challenges, and by exploiting synergies both in the use of facilities and the development of new technologies.

Through its science programmes, the STFC gives the highest priority to exploiting recent investments in major national and international facilities which will tackle some of the most exciting science challenges of the next decade. The Council's subscriptions to international organisations are crucial to the delivery of its science strategy and the STFC's international credibility and leverage. Exploitation of these

Enabling growth through world class science and technology

Developing

facilities is supported through the provision of grants to universities. At the same time, the Council is also investing in a prioritised programme of innovative, underpinning technology development, including accelerator science and technology, detectors, sensors, and space technology which will enhance the effective exploitation of major national and international facilities and the Council's programmes, to the benefit of society and the UK economy.

As part of the development of a high-level corporate strategy that addresses the full range of STFC activities, a coherent science and technology strategy is being developed which will inform the Council's first 10-year investment plan and priorities. The Science and Technology Strategy is being developed within the financial context set by the Comprehensive Spending Review (CSR) settlement presented in October 2007; during the CSR's three-year period, STFC will spend over £1.9 billion in support of UK science and technology.

To form an effective investment plan, the Council requires a clear view of the big science challenges which need to be addressed, the potential and opportunities for making breakthrough discoveries, the technology capabilities needed, and the relative strengths of the UK to either win leadership of or be an effective partner within international collaborations. Working closely with the research community, facility Directors and international partners, the Council's Science Programmes Office ensures that the STFC is fully informed on both opportunities and aspirations to understand the science strategies and facilities needed to deliver them.

The Council's goal is to fund the best research, working for the UK as a whole and to support projects and ideas that are adventurous, do new things, where the UK clearly influences the direction of the project and that are focused on excellence.

STFC aims to focus its in-house activities on projects that are demonstrably excellent (whose output are among the best in the world), those that complement what can be done by universities or commercial organisations and build strategic value in terms of a coherent programme or for the future. In addition, the STFC is embarking on a horizon-scanning project that will assist in mapping the future of large scale science, the outcome of which will feed into the Council's strategies.

Due to be published in 2008, the STFC science and technology strategy will build on existing strategies including the Neutron Review (conducted in 2006-2007) and the Light Source Review (conducted in 2007-2008). Following publication, the strategy will be reviewed on a regular basis to ensure that STFC remains both a cutting edge and dynamic organisation.

Web: www.scitech.ac.uk/About/Strat/Council/council.aspx

Programmatic Review

The Programmatic Review is a comprehensive biennial review of STFC's operational facilities, projects and other scientific investments.

Through the review, the strategic importance, impact, competitiveness, level of UK involvement, scientific user base, science output, outreach, training and industrial impact of each project and facility are assessed. By providing up-to-date information on the quality of current programmes and their future scientific impact, the review enables informed programme planning and guides future investment decisions.

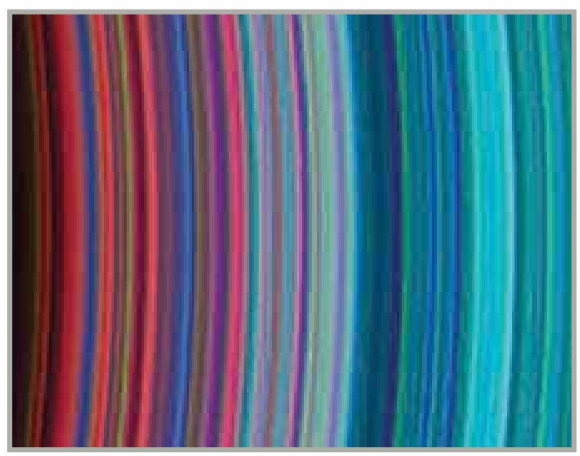
During 2007-2008, overseen by the Science Board, the Science Committees for Particle Physics, Astronomy and Nuclear Physics (PPAN) and for Physical and Life Sciences (PALS), carried out the review using material provided by project and facility managers and by the STFC. PALS also undertook additional bibliometric research of the facilities' productivity. Membership of the Science Board and Committees is available on page 138.

The current review was initiated in late summer 2007 as a planned step in forming STFC's science and technology strategy. Material was collected during the autumn, and PPAN and PALS made initial assessments in December which were presented to and discussed by Science Board. PPAN and PALS then made final assessments in January 2008, which were approved at Science Board and presented to the STFC Council. Council agreed the contents of the present consultation in February 2008.

Neither PPAN nor PALS identified any poor quality projects in their rankings. In fact, all of the projects and facilities reviewed were doing, or would do, good science, and all were of sufficient quality to be funded. Inevitably there are more good ideas than available resources. This exercise is, therefore, essentially about re-prioritisation and the STFC will have to cease to support some projects to ensure that the best receive investment, including new opportunities.

In March 2008, the research community was consulted on the outcome of the Programmatic Review; over 1,400 comments were received. The Council would like to thank the research community for engaging with the review.

Panels of active researchers were formed to review, distil and synthesise the comments, the outcome if which will be reported to the Science Board and the STFC Executive, via the PPAN and PALS committees, in May 2008. The Council's conclusions on the programme will be announced in July 2008.



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UK Light Source Review

During 2007-2008, an independent, international panel of experts provided advice to STFC on the current UK light source capabilities and future options in the development of this field.

The panel considered the scientific capabilities and opportunities provided by the current suite of UK light sources, opportunities for collaboration with other countries in the provision of access for UK scientists and the complementarity of existing and proposed new sources in underpinning scientific programmes.

Panel membership:

- Dr Murray Gibson – Argonne National Laboratory (Chairman)
- Dr Jerry Hastings – Stanford Synchrotron Radiation Laboratory
- Professor Yves Petroff – Former Director, European Synchrotron Radiation Facility
- Professor Wolfgang Sandner – Max-Born Institut, Berlin

The panel's report recognised the UK research community's strong record in photon science and the development of innovative source and detector technologies.

An opportunity for the UK to develop a world class next generation light source facility, utilising the country's substantial expertise and capabilities in accelerators, lasers and associated technologies, was highlighted. The panel recommended that a New Light Source project be launched to build on the excellent work on the 4th Generation Light Source project and the more recent Diamond Sapphire proposal. Whilst scientifically exciting, these projects were not deemed to provide an optimum way forward for the UK. Instead, the New Light Source project should look afresh at the priority science drivers and source technology options.

Focusing on Photon Science

Following the Light Source Review, the STFC formed the Photon Science Department to coordinate the operation and development of light source facilities and associated science, pulling together expertise in the Central Laser Facility and the Synchrotron Radiation Department. The new department will engage in ongoing consultation with the community on its scientific priorities.

A plan for a dedicated Research Institute for Photon Science was also formed in response to the review. Due to be launched in April 2008, the Institute will focus on the scientific exploitation of next-generation light sources such as free electron and attosecond laser facilities, with the goal of nurturing and growing cutting-edge photon science within the UK.

New UK Light Source

In addition to running and developing world leading photon science facilities and programmes, the new Photon Science Department is playing a key role in defining the New Light Source for the UK, working with STFC's Accelerator Science and Technology centre and the wider academic community.

The New Light Source project will assess the scientific priorities across a wide range of disciplines from physics to biology, considering the potential of emerging sources such as the use of exceptionally intense, ultra-short pulse photon beams.

The New Light Source project team, comprising staff from STFC's Daresbury and Rutherford Appleton Laboratories, the Diamond Light Source and universities throughout the UK, faces many technical challenges. Project leader Professor Jon Marangos, from Imperial College, is confident that the UK has the expertise to produce a robust case that will fully exploit the science potential of this field.

The STFC believes that this project provides the best opportunity for the UK to maintain its leadership in photon science and is looking forward to working with the research community to develop a focused, sustainable, science driven proposal for a new facility by Autumn 2009.

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The STFC actively encourages collaboration and interaction between partners in industry, academia and the Council with the aim of demonstrating and increasing economic impact for the UK. The STFC's role in the National Science and Innovation Campuses coupled with its unique scientific heritage, research facilities, underpinning technologies and wide academic user base provide a unique environment for increasing economic impact through knowledge exchange and open innovation. Increasing economic impact is a strong theme throughout the Council's programme of activities and knowledge exchange activities are driven by the requirement to demonstrate and deliver this.

Benefitting the economy

Science and Innovation Campuses

The STFC Campuses (see page 14) are the most innovative and ambitious aspect of the Council's Knowledge Exchange programme. Set to be recognised as leading centres of excellence for science and innovation, the vision is to create multi-partner mixed-economy campuses with STFC facilities and science and technology programmes embedded at the heart of the model.

The STFC programmes will be further enhanced through co-location of Higher Educational Institutes and international science and technology programmes which will act as primary catalysts for innovation. Five Gateway Centres have also been scoped to encourage engagement, knowledge exchange and innovation in key technology areas (page 60).

Skills development

STFC laboratories offer a unique training ground for developing highly skilled technicians and dynamic researchers who will populate academic posts and positions in industry, thus driving the wider economy. During 2007-2008, the Council developed strategic national and regional partnerships to establish skills development and capacity building programmes, a key component of the Campus initiatives, which will drive the delivery of a skilled workforce for the UK.

See 'Investing in people' for further details on the wide range of excellent learning and development schemes run by the STFC for staff and the research community.

Commercialisation

Central Laboratory Innovation and Knowledge Transfer Limited (CLIK), the wholly owned commercial arm of STFC, manages the commercial exploitation of intellectual property and other assets owned by the Council.

During 2007-2008, revenue of over £350,000 was achieved by CLIK's sales team through promoting commercial access to STFC facilities (page 17), expertise and products. With 14 new patents filed during the year, CLIK is now actively managing 65 live patent families. CLIK and STFC's 'proof of concept' funds, which develop and validate early stage technology with commercial potential, are an essential aspect of the commercialisation process.

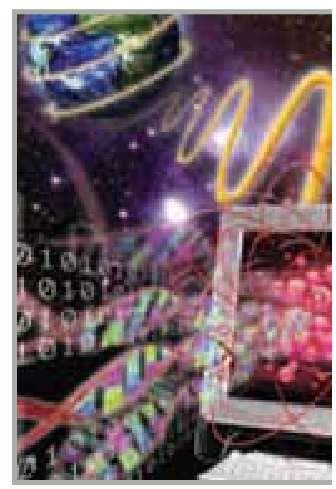
CLIK's new model for supporting new spin-out companies, which exploits STFC's in-house expertise to nurture fledgling businesses, is proving successful. Currently involved with six operating spin-out companies, ranging from security technology to medical equipment (page 18), CLIK has three more spin-outs under development and several more on the horizon.

Large facilities

The large facility research programmes, coordinated by STFC for both its own large facilities and those with which it has shareholdings, such as CERN, the European Space Agency (ESA), the European Southern Observatory (ESO), the European Synchrotron Radiation Facility (ESRF), the Institut Laue-Langevin (ILL) and Diamond Light Source Ltd, have continued to engage with industry in terms of suppliers,

Courtesy Dreamstime

Courtesy Dreamstime



knowledge exchange and access as users, and a common database for industrial contacts has been developed. Together with the Technology Strategy Board's Sensors and Instrumentation Knowledge Transfer Network, the STFC is actively engaging with researchers and industry, organising joint events and promoting large research facilities.

The UK continues to lead member states in exploiting commercial opportunities from CERN through the Department for Innovation Universities and Skills' Public Sector Research Exploitation Fund which has now been increased to include ESO and the UK Astronomy Technology Centre.

Increasing opportunities

The STFC has a high level of commitment to increasing the opportunities for knowledge exchange and economic impact arising from both in-house activities and the academic research community that it supports (page 19).

Knowledge exchange activities within STFC's laboratories – Daresbury Laboratory, Rutherford Appleton Laboratory and the UK Astronomy Technology Centre – have stepped up a gear by embedding knowledge exchange within departmental and staff objectives and the creation of several key staff roles to encourage knowledge exchange and innovation activities.

Effective and efficient high technology knowledge exchange is delivered through the movement of skilled people between research establishments and industrial sectors.

The Industry Programme Support Scheme (PIPSS), together with the Follow-on Fund are the core funding mechanism available to support academic groups to explore the commercial potential of technologies and know-how developed to support the science programme (page 16). During the year, themed calls in Defence and Security and a themed Bio-Mini PIPSS call, in collaboration with the Biotechnology and Biological Sciences Research Council (BBSRC) were successfully delivered and the University of Glasgow/Scottish Universities Physics Alliance and the University of Cambridge were awarded the first PIPSS Fellowships. By the year end, the commitment to support knowledge exchange grants was at an all time high of £1.75 million.

KITE Club events provide fora for the STFC supported community to network and meet with potential knowledge exchange collaborators. Over 700 people participated in KITE Club workshops and brokering meetings during 2007-2008 and the Nuclear Physics community are now embraced within the programme.

The STFC is currently developing its Economic Impact Strategy to further exploit the distinctive strengths of the Council, ensuring maximum returns on the UK's investment in science and technology research. Further details of some of the economic opportunities and benefits that the STFC's Knowledge Exchange programme and the National Campuses can bring are outlined in the rest of this section.

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The National Science and Innovation Campuses

The creation of the Daresbury and Harwell Science and Innovation Campuses has provided a unique platform for the public and private sector to participate in collaborative science and technology programmes across disciplines and sectors as never before.


Cockcroft Institute, DSIC


Daresbury Innovation Centre, DSIC

Together, the two Campuses form a 'dipole' model: two pillars of excellence, building on and expanding their expertise within science, technology, innovation and business. Knowledge Exchange, a vital component of the model, ensures that the Campuses make an outstanding contribution to driving and developing the knowledge economy. Such a contribution would be impossible without STFC's close collaboration with both the private and public sector including universities, Regional Development Agencies and local councils. With the involvement of key academic, political and commercial stakeholders, the Campuses will become 'knowledge beacons' for UK plc.

The Campus Vision

The National Science and Innovation Campuses will become world-leading, internationally-regarded centres of excellence in science, technology and innovation, providing opportunities for businesses, universities and other public sector bodies to:

- work in an amenity rich, collaborative environment that promotes exciting new open innovation techniques;
- access the STFC's advanced facilities and scientific and technical expertise;
- access a unique training ground with a highly qualified mix of professionals, ranging from experienced technicians through to dynamic researchers and academics; and
- collaborate with the STFC and other Campus partners in an exciting and innovative environment with new partnership models.

STFC's vision for the Science and Innovation Campuses is that they will be national focal points for interaction between world class 'embedded science' facilities, ultra-high technology capabilities, world leading researchers in universities and a strong and rapidly growing business base.

Developed around a positive planning policy framework, the Campuses will offer a high quality environment for new industrial research activities and knowledge intensive businesses and be powerful attractors of inward investment from the international research and development sector and multi-national companies.

Building on involvement from industrial and academic partners from a wide spectrum of Research Council activities, the co-location of scientists, innovators, and the world class research infrastructure of STFC will create an exciting and fertile environment for the development of the UK's National Science and Innovation Campuses.

Daresbury Science and Innovation Campus

Based at the STFC Daresbury Laboratory near Warrington, Cheshire, the Daresbury Science and Innovation Campus is a vibrant collaboration involving the STFC, the North West Development


Artistic Impression of the planned new Research Complex, HSIC


The new computer building at the Rutherford Appleton Laboratory

Agency, the Universities of Manchester, Liverpool and Lancaster, and Halton Borough Council, all of whom are represented on the board of the company – DSIC Ltd – which oversees the initiative.

There are currently three major components to DSIC:

- Daresbury Innovation Centre. A state-of-the-art facility designed to attract entrepreneurial science and technology based businesses. There are already more than 60 businesses housed in the Centre, ranging from small and medium sized companies to footholds of large corporate institutions, including: Apple Dynamics, Calon Associates Ltd, Atmos Technologies (see page 19), Devigo, EnviroCentre and IBM.
- Cockcroft Institute for Accelerator Science and Technology. A joint venture between the Universities of Lancaster, Liverpool and Manchester, and STFC, the Institute provides a new critical mass of intellectual focus, educational infrastructure and the essential scientific and technological facilities for accelerator research and development. This enables UK scientists and engineers to play a major role in innovating future tools for scientific discoveries through their conception, design, construction and use across the world.
- STFC Daresbury Laboratory. An internationally recognised research centre, the Daresbury Laboratory hosts major STFC research facilities as well as a number of strategically important resources including supercomputing, e-science and nuclear physics.

A total of 71 companies are now based at DSIC with a split of 45% Digital/ICT, 20% Healthcare, 20% Advanced Engineering/Instrumentation and 15% others. The total number of employees is approximately 235 with 50 new jobs created since the companies moved to the Campus.

Harwell Science and Innovation Campus

The Harwell Science and Innovation Campus (HSIC) encompasses the STFC's Rutherford Appleton Laboratory site and UKAEA Harwell interests near Didcot, South Oxfordshire. These public sector participants will very shortly be forming a joint venture company with a private sector partner to provide very significant ongoing Campus investment.

The partners already enjoy close working relationships with their neighbours on the Campus who include the Diamond Light Source (one of the world's most powerful X-ray, infrared and ultra-violet light sources which allows for exceptional material imaging), the Medical Research Council and the Health Protection Agency. The Campus currently hosts a wide range of organisations including 54 tenants and 65 organisations in the two innovation centres alone. In total, HSIC has approximately 4,500 employees on site.

Early plans and concept designs have been developed which provide incubator space for new businesses, specialist research institutes and conference facilities. This is all integrated with the STFC's Rutherford Appleton Laboratory research facilities, which include the Central Laser Facility, ISIS (the world's leading pulsed neutron source) and one of Europe's largest Space Science and Technology Departments.

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	www.daresburyinnovation.co.uk
	www.cockcroft.ac.uk
	www.harwell.org.uk

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Making an impact

Images (approximately 15 billion) and video make up over 70% of the digital data available online. Unable to index this information directly, traditional search engines rely on text descriptions entered by hand. Imense has developed a system that automatically analyses images in terms of their content, without the need for human generated captions, combined with a powerful search facility.

In 2006, however, Imense's future seemed uncertain. Securing investment to produce a commercially viable product was virtually impossible without thorough product testing. Dr David Sinclair, one of the founders of Imense, explains, "We built a prototype of our new image analysis and search technology, but simply weren't able to test our software on sufficiently large numbers of photos. We knew we could search tens of thousands of pictures, but couldn't afford to try it on hundreds of thousands or millions of images."

Dr Sinclair stumbled upon the answer to Imense's problems at a meeting on Grid opportunities for industry arranged by the STFC. Spread across 17 sites, the UK Particle Physics Grid (GridPP) had been built to analyse the petabytes of data expected from Europe's newest particle accelerator, the Large Hadron Collider at CERN. The Grid's 8,000 computers had been shared with other researchers, from geophysicists to biologists. Image analysis seemed a naturally parallel process which would fit perfectly with the Grid's capabilities; Dr Sinclair contacted the Council's knowledge exchange team to see if they could help.

The Council linked Imense up to the University of Cambridge's e-Science Centre and, through provision of a modest award, helped the testing get underway. The partnership was a huge success. Imense's software was developed to run on the Grid and three million images were successfully analysed.

Reaping the rewards of their Grid experience, Imense has now secured an investment of more than £500,000 to help deliver the final product to the market place.

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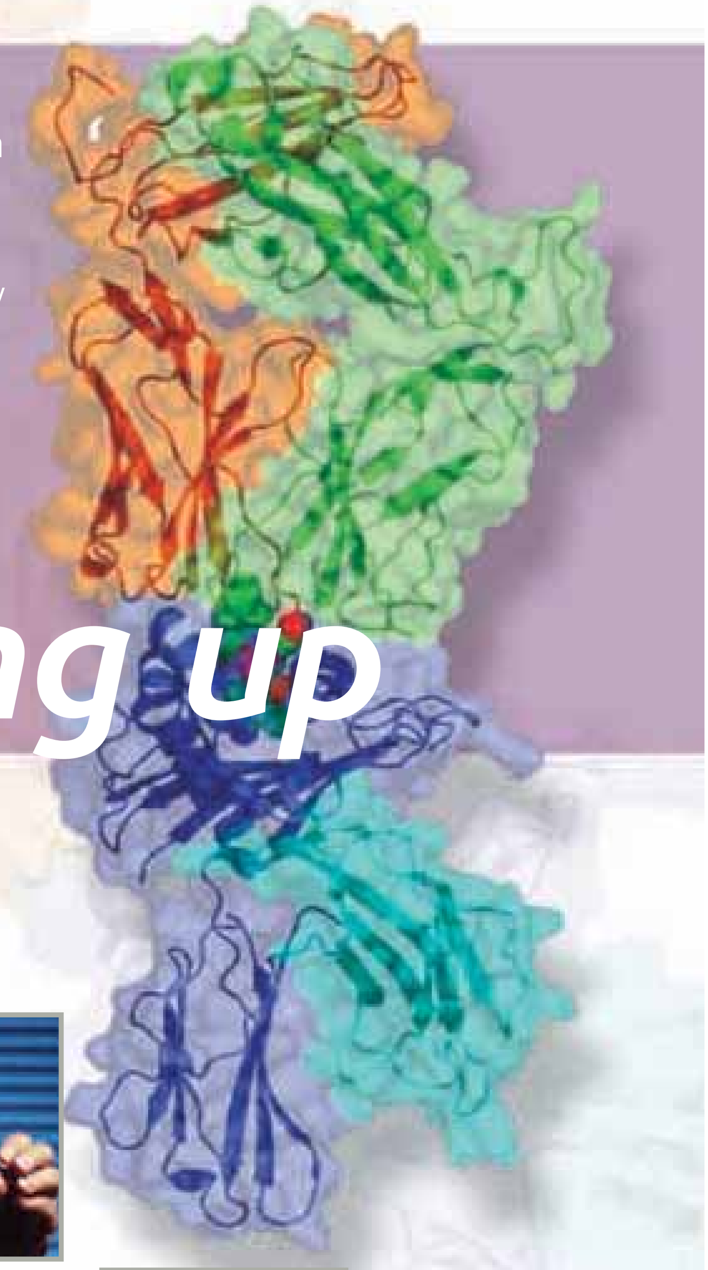


Drug discovery is huge business with huge potential benefits to mankind. The Synchrotron Radiation Source (SRS) at Daresbury Laboratory is now offering a unique commercial service aimed to cut the time required to discover new drugs.

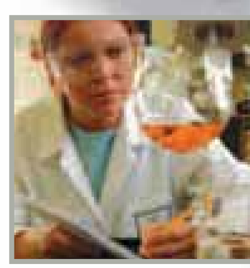
Speeding up *drug development*

Pharmaceutical companies use protein crystallography at the early stages of the drug development process to understand the structure of their targets, any potential drugs and how they interact which each other.

The use of a powerful synchrotron X-ray source is invaluable as it provides faster and better resolution sample processing than any normal laboratory equipment. Samples that may take three to four days to process on a conventional X-ray source are completed in approximately four hours at the SRS.

Historically, however, pharmaceutical companies have primarily accessed synchrotrons through research programmes and collaborations with universities. Commercial research often fitted around academic programmes, risking expensive delays to research and development.

In March 2007, the protein crystallography station was due to be decommissioned as part of the closure of the SRS but CLIK, the Science and Technology Facilities Council's technology exchange company, recognised the potential for the creation of the first 100% industry-dedicated synchrotron station in the world for protein crystallography. As a result, the station will now be open until December 2008.



Companies may utilise the synchrotron within 48 hours after the first contact. Samples can be shipped in to the SRS, via courier service (the preferred method for many companies), for analysis by the Council's world-leading scientists on behalf of commercial customers. Alternatively, if preferred, research and development teams may conduct experiments themselves, with expert assistance from an onsite support team.

Faster and more efficient processing alone has major economic benefits for commercial research programmes; speeding up drug development and the resultant benefits to society is invaluable.

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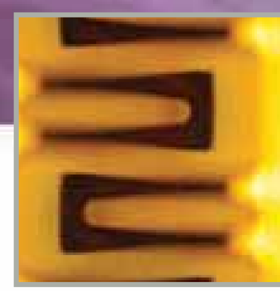
Immediate and accurate tests to diagnose and monitor bleeding and blood clotting disorders could soon be available at every GP's surgery.

Easing a sticky subject



Micro-fabricated devices are extremely reliable, very small and cheap to manufacture in large quantities

Although blood clotting is essential to prevent serious bleeding in the case of skin cuts, clots that occur inside blood vessels can block the flow of blood to major organs, causing heart attacks and strokes. Anticoagulant drugs, such as warfarin, reduce the ability to form clots, however, when the dosage is incorrect they can increase the risk of severe external or internal bleeding. Accurate monitoring of patients' blood is, therefore, essential to enable medical practitioners to maintain the precise dosage of medication required. Traditionally patients encounter a lengthy process of providing a blood sample at a doctor's practice or hospital which would then be sent for analysis, the results of which would be available hours or days later. For these patients, frequent blood testing is a necessity, resulting in hundreds of thousands of blood tests being carried out every year in the UK alone. As both the US and German governments now pay for such tests to be carried out at home, the market for home testing of Warfarin therapy now offers a potential $4 billion opportunity.

Medical diagnostics is rapidly moving towards more effective and immediate testing for patients. Microvisk's innovative use of micro-technology provides instant testing and analysis of blood viscosity, commonly referred to as 'thickness' or 'stickiness', of a patient's blood in the surgery using just a pin prick of blood. This is an easier, quicker, less intrusive and cheaper approach to measure, with laboratory-standard accuracy, whether a patient is receiving the correct anticoagulant dosage. At the heart of Microvisk's hand-held system is a micro sensor that is less than a millimetre in size, containing a microscopic cantilever device. The micro sensors, based on similar technology to silicon chips are so inexpensive to produce they are disposable, a pre requisite of any human blood test.

Founded by CLIK, the STFC's wholly owned technology exploitation company, Microvisk's technology is based on Council's extensive expertise in microstructures. Microvisk is an exciting example of how ground-breaking science is being used to meet society's real needs, with direct benefits to both our health and the UK economy.

microvisk technologies

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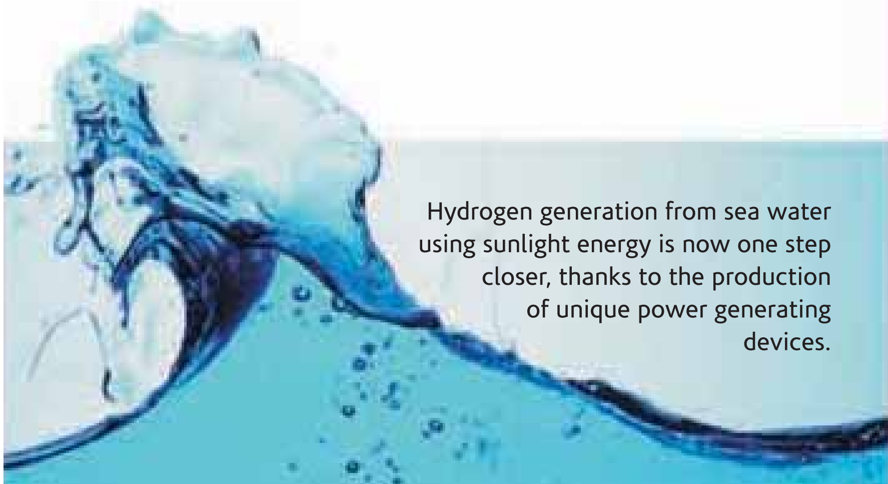

Reducing *hydrogen's carbon footprint*

Hydrogen generation from sea water using sunlight energy is now one step closer, thanks to the production of unique power generating devices.

Hydrogen is separated from sea water using electricity conducted between two submerged terminals, generating hydrogen at one terminal and oxygen at the other. The oxygen can either be collected or released back into the atmosphere. The hydrogen is collected and stored for use in fuel cells or as an alternative fuel in conventional engines.

The use of mains electricity is not economical for hydrogen generation as the cost of energy required outweighs the energy provided by the hydrogen, i.e. the carbon footprint is too high. Scientists at Atmos Technologies, based at the STFC Daresbury Laboratory, however, have found a solution – a completely new, environmentally friendly technique for the production of photo voltaic diodes which use sunlight to generate electrical power.

Traditionally, the production of all silicon power generating diodes consumes a total of 150 kilowatt hours of electricity to manufacture 1 kg of silicon for production into power generating devices. This means that it takes up to five years before more energy is produced than was used during manufacture. Furthermore, 'clean room' conditions are always required due to the necessary use of toxic substances, such as phosphorous, arsenic and hydro-fluoric acid.

Production of the new photo voltaic diodes involves a new non-toxic 'flame spraying' method which has the same efficiencies as current silicon devices but uses only 1/60 of the energy compared to conventional techniques. As a result, diodes can now be produced at a fraction of the cost and with a substantially lower carbon footprint than those created by conventional methods.

Atmos' non toxic manufacturing process means that it is now possible to generate hydrogen from sea water without harming the environment in the process. In fact, the technique can be considered a virtually pollution-free means of generating hydrogen from seawater using sunlight, providing an ever renewable, non polluting fuel from a free energy source that could be used in fuel cells for petrol engines or to produce electricity for homes.

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Radiation detection *with plastics*

In applications ranging from hospital X-ray machines to instruments for astronomy, the standard way to measure the dose of radiation is to use a detector made from an inorganic semiconductor, such as silicon. However, such detectors are not flexible and their application to large areas is not easy.

A team of physicists from the University of Surrey, led by Dr Paul Sellin, has developed a new type of detector set to tackle such problems – made from a new type of plastic that conducts electricity. As the radiation dose increases, the current flow in the new plastic detector increases, allowing accurate measurements to be made. The research recently received a boost in the form of a one-year research grant from the STFC which is being shared with Centronic Ltd., a Croydon-based company that manufactures and develops radiation detectors.

The Surrey team has published their preliminary findings in the prestigious international journal, Applied Physics Letters. Dr Sellin and his collaborators, Dr Alan Dalton and Dr Joe Keddie, have also filed a patent on organic radiation detectors with support from the university.

The team's success has grown from a collaborative effort drawing on the experience and expertise of the university's Soft Condensed Matter Physics Group in making polymer films. Both the Radiation and Soft Matter Laboratories within the Physics Department have benefited from recent investment from the government's Science Research Investment Fund. Together with support from the STFC, such investment is clearly leading to exciting scientific results.

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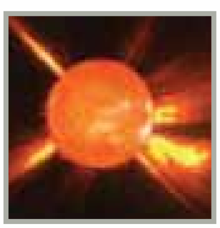
Since the Industrial Revolution, the growth of economies throughout the world has been driven largely by the pursuit of scientific understanding, the application of engineering solutions, and continual technological innovation. A significant part of the benefit society enjoys today and will enjoy in the future is tied to how well science, engineering and technology is integrated with economic factors.

Delivering world science and



Courtesy STScI/NASA

Science and discovery

From searching for signs of life on other planets, studying solar flares and analysing materials, to investigating new energy sources, monitoring climatic change and developing large scale research facilities, the Science and Technology Facilities Council (STFC) is delivering world class science for the UK.

The Council's wide-ranging research programmes include: Astronomy, Energy Research, High Power Lasers, Neutron Sources, Nuclear Physics, Particle Physics, Particle Astrophysics, Space Science and Synchrotron Radiation. Through scientific and technological excellence, the STFC is increasing understanding of our place in the Universe and solving pressing problems of societal relevance. Indeed, the Council funds research into some of the most fundamental mysteries and life's biggest questions – from the properties of the Universe itself through to the formation of galaxies, stars, planets, and the origins of life.

In order to answer these questions, STFC's science programmes and facilities all build on common technological competencies. With world-leading capabilities in such areas as particle accelerators, sensors and detectors, advanced engineering, and cutting edge computing, simulation and modelling, the Council's technological capabilities are made possible by a strong theme of collaboration – bringing together the skills base in universities, industry and the STFC's laboratories (Daresbury Laboratory, Rutherford Appleton Laboratory and the UK Astronomy Technology Centre). Indeed, scientists and engineers world-wide benefit from access to outstanding facilities and world class expertise thanks to the Council and its collaboration with a multitude of international organisations including: the European Organization for Nuclear Research (CERN); the European Space Agency (ESA); the European Southern Observatory (ESO); the European Synchrotron Radiation Facility (ESRF); the Institut Laue-Langevin (ILL); and telescope facilities in Chile, Hawaii, La Palma, Australia and the MERLIN/ Very Long Baseline Interferometry National Facility at Jodrell Bank in Cheshire. Guardian of the future of scientific research and development, the STFC also provides strategic advice to the UK government on facility development.

The Council, however, is not only increasing knowledge of the environment around us. Developing new materials, discovering ways to detect terrorist

Courtesy Nik Szymanek

threats, uncovering the morphology of viruses, modeling the heart, and exploring new fuel sources are just a few examples of the wide-ranging work that is also supported through the STFC's advanced technological capabilities, not forgetting fundamental research which sits at the core of its science programmes.

Driving economic growth

Evaluation of the benefits stemming from science, innovation and technology is increasingly important due to demands for greater public accountability and transparency, and the requirement to demonstrate how the money invested is producing returns to society and the UK economy.

Courtesy Dreamstime

class technology

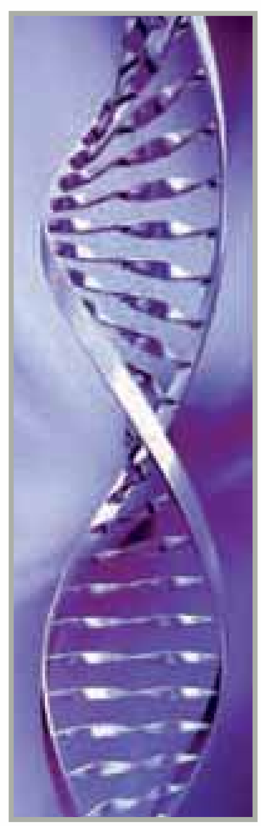
Courtesy Daimler

What makes science, innovation, and technology such powerful drivers of economic growth? Unlike capital and labour, they do not suffer from diminishing returns. Indeed, in many cases the creation of scientific knowledge and technological innovation actually increase the return to further knowledge and innovation, thus creating a powerful growth mechanism.

The benefits gained from STFC's world class science, technology and innovation are extensive. Undertaken in universities, the Council's laboratories and at observatories and facilities both in the UK and overseas, STFC supported research spans an impressive range of science, engineering and technology. From the study of cancer and exploring the potential of nanotechnology, to the development of materials and technology to meet the demands of harnessing new energy sources, advancing health care, enabling better communications and expanding electronic storage, the potential benefits to both society and the economy are often clear.

Not all major discoveries have an obvious economic impact. For example, many discoveries made through particle physics research, though fundamental to understanding the structure of the Universe, can not easily claim a direct economic benefit. However, the requirement for better communications whilst pursuing this fundamental science resulted in technology that is now at the core of industry and commerce – the World Wide Web. Similarly, when Bose and Einstein discovered that light could be amplified, no immediate economic impact was obvious but this lead, 40 years later, to the development of lasers – with a multitude of applications, the laser industry is now worth billions. Fundamental science is, therefore, just as vital to the economy as it provides the key to knowledge and innovation.

The UK is at the frontier of modern technological and scientific advances. Sustaining economic growth depends substantially on the ability to advance that frontier, delivering world class science and technology for the benefit of society and the UK economy.



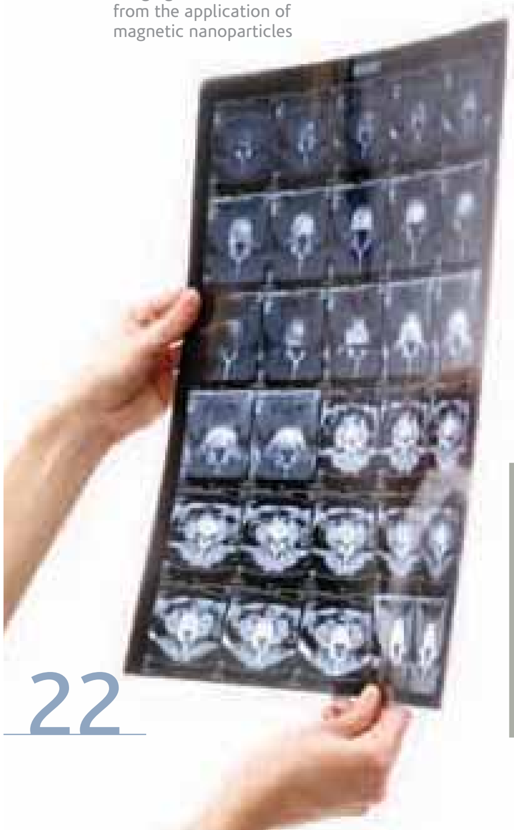
Microbe nanomagnets go hard core

Bacteria show researchers how to fine-tune magnetic nanoparticles

Bacteria are amazing. Their behaviour seems to be infinitely variable. They can produce useful chemicals, live in the most inhospitable surroundings including, allegedly, outer space – and, worryingly, can adapt quickly to resist the onslaught of antibiotics. One particular kind even responds to the Earth's magnetic field, always turning in the direction of the North or South Poles.

These 'magnetotactic' bacteria have recently caught the attention of materials scientists, the reason being that the microbes soak up iron and grow small but perfectly formed crystalline grains of magnetic iron oxide – magnetite. And that's just what's needed for high-density magnetic storage and nanotechnology applications, particularly in medicine.

MRI (magnetic resonance imaging) could benefit from the application of magnetic nanoparticles



With these possibilities in mind, Dr Sarah Staniland and her colleagues at the University of Edinburgh decided to take a closer look at three magnetotactic bacterial strains *Magnetospirillum gryphyswaldense*, *Magnetospirillum magnetotacticum*, *Magnetospirillum magneticum*, and see if they could be persuaded to make magnetite nanoparticles containing a smidgen of cobalt. Modern data storage media rely increasingly on magnetic particles based on iron 'doped' with cobalt. The information is encoded in the direction of magnetisation of individual particles. An external magnetic field can then be employed to reverse the direction, so writing, or over-writing the data. The harder it is for the field to cause reversal, the more stable is the magnetisation - an important issue in the goal to store information more densely as ever smaller particles. Adding cobalt provides this extra 'hardness'. This is where the magnetotactic bacteria could prove useful; their genetics enables them to manufacture magnetic particles at the nano-scale, with a precision unmatched by man-made techniques (see box, right). The question was, however: would the bacteria take up cobalt?

MRI scan of the spine

Dr Staniland admits that when they started the experiments, they did not know much about how the bacteria behave. Biologists had tried to coax the bacteria into taking up other metals like cobalt but had failed; they were convinced that the conditions for uptake were just too specific. "If I had been a biologist I would never have attempted it – but a lack of understanding of the biological behaviour actually helped in this case." she laughs. "We approached the research from a materials-science point of view. We just added a soluble cobalt compound to the culture, slowly increasing it and waited to see what happened," says Dr Staniland. Indeed, she was first time lucky in finding the ideal concentrations of cobalt in which the bacteria would grow; with too much cobalt in the growing medium, the bacteria made fewer grains and eventually stopped growing altogether at the highest concentrations. Having established the optimum concentration, Dr Staniland was able to vary the ratio of cobalt to iron.

Laboratory elemental analysis of the grains confirmed that all three bacterial strains had, indeed, feasted happily on a diet including a dash of cobalt. What is more, experiments measuring the changes in magnetisation with increasing and decreasing magnetic fields showed that the cobalt doped magnetosomes that formed were indeed 'harder', needing a stronger coercive field to reverse polarity.

Magnetic bacteria could help in the development of environmentally-friendly production of nanoparticles needed for digital memory storage

Analysis at Daresbury

To clarify the results further, samples were then taken to STFC's Daresbury Laboratory in Cheshire, which is home to the UK Synchrotron Radiation Source (SRS). This is a large machine that generates high-intensity electromagnetic radiation at all wavelengths from X-rays to infrared. X-rays are absorbed by metal atoms to give a characteristic signal, and are an ideal tool for studying metal-containing materials. Furthermore, by using polarised X-rays (the electromagnetic waves all oriented in the same direction), the magnetic properties of the atoms can also be probed. Employing the two approaches, the Daresbury team was able to establish how the iron and cobalt were distributed in the grains' crystal structure. They found, for example, that there was probably more cobalt nearer the grain surface, presumably because the iron was deposited more quickly.

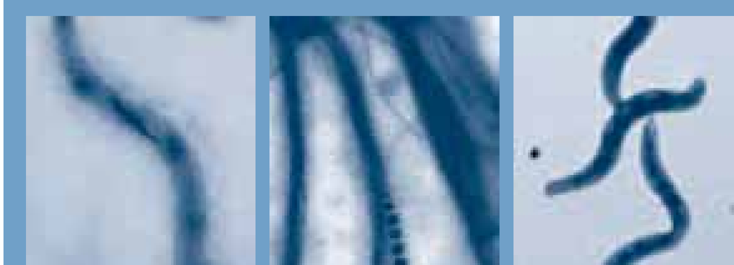
Applications

Would magnetic bacteria ever be used as a source of nanoparticles for memory storage? It is unlikely that they could produce the industrial amounts required. However, by studying how bacteria synthesise such perfect crystals, researchers aim to mimic the underlying biological processes – which take place under mild, environmentally-friendly conditions, and without the need for complex and expensive fabrication equipment often required in the electronics industry. Dr Staniland is now working on stripping the bacterial magnet-making machinery down to its bare biochemical bones, and using that to synthesise tailored particles with specific metallic compositions and magnetic properties. Other metals such as nickel are on the menu. "It would be fantastic if we could mass-produce fine magnetic particles to order using just the proteins that direct the biomineralisation process," says Dr Staniland.

A particular advantage of the biological approach is that the particles could come ready packaged in their own biological membranes, which would enhance tissue compatibility in medical applications. Magnetic nanoparticles made this way could be precisely tailored for specialised clinical procedures. In a technique called cancer hyperthermia, magnetic nanoparticles are targeted at a tumour. An exterior magnetic field then heats up the particles so that they kill the cancer cells. Another application is as an imaging enhancement agent for MRI (magnetic resonance imaging) – now a crucial clinical diagnostic tool. Magnetic nanoparticles could also be employed as a vehicle for targeted drug-delivery into cells.

MYSTERIES OF MAGNETIC MICROBES

Magnetotactic bacteria, which swim along magnetic-field lines, were discovered more than 30 years ago, and have fascinated biologists ever since. They live in oxygen-limited boggy sediments, and absorb small amounts of iron that exist in the watery environment. Once inside the bacterial cells, the iron is precipitated out as perfect magnetite crystals, all of similar shape and size. The dimensions can vary from 30 to 130 nanometres and several different crystal forms are possible; however, for each bacterial strain, the crystals are all exactly the same. Each grain is neatly wrapped in a fatty, lipid membrane to form a so-called magnetosome. These link in chains which lie along the bacterium's worm-like structure so as to give the maximum magnetic response. Biologists are still trying to work out how and why these miniature natural magnets evolved, and the exact biochemical mechanism by which iron is taken up and stored in the bacterial cell, as well as the underlying genetics that tightly control the process of biomineralisation.



Chains of magnetite nanomagnetic particles in *Magnetospirillum*

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Understanding cancer with supercomputers

One of the main challenges in health science today is to understand the origin of disease at the molecular level. This requires applying a wide range of largescale analytical tools – such as the UK's Diamond Light Source – combined with various chemical and biological techniques to analyse bio-molecules like proteins and the assemblies into which they organise themselves. These structures are often awesomely complex and difficult to unravel, and so powerful computers are increasingly being used to make predictions about structure, which then help researchers interpret their experimental results correctly.

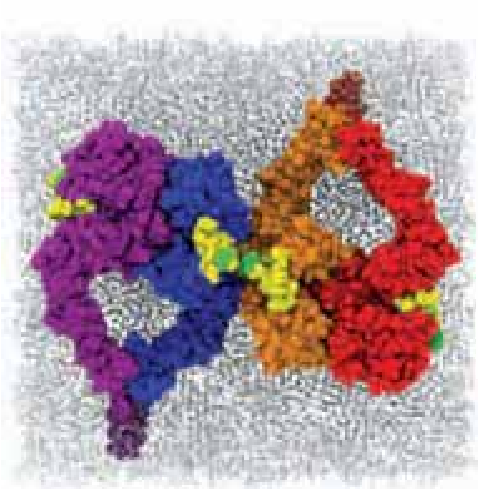
STFC's Computational Science and Engineering Department (CSE) at the Daresbury Laboratory in Cheshire operates several supercomputers which provide computational support for UK research communities. One of the strategic aims of CSE is to develop the burgeoning area of computational biology. Supercomputers are now powerful enough to simulate the simultaneous behaviour of hundreds of thousands of atoms – a capability that is crucial to deal with large molecular structures such as protein complexes and cell membranes. During the past year, CSE has been collaborating with research teams from the Daresbury Laboratory Photon Science Department and the University of Liverpool to analyse the structure of a molecular complex implicated in cellular processes leading to certain cancers.

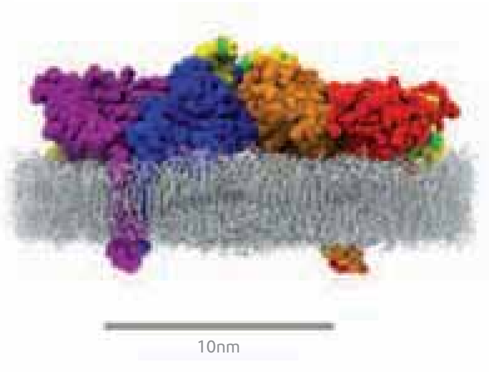
Cell division, and cell death, involves an intricate cascade of molecular changes. A key trigger is the initial binding of a small protein called an epidermal growth factor (EGF) to a receptor – the epidermal growth factor receptor (EGFR) – which straddles the cell membrane. A large component of this protein sits outside the cell; it is linked via a single chain of amino acids to a second domain inside the cell. Any change, for instance in shape or position, in the extracellular domain caused by the binding of a factor acts as a signal, which is transmitted to inside the cell. There, it sets off the sequence of biochemical processes that eventually decides the cell's fate.

A double structure

EGFR belongs to a family of four receptors with similar structures, and molecular biologists have been trying to work out exactly how they are activated. Although a full three-dimensional molecular structure is not yet available, the receptors, when bound to their factors, appear to assemble into a double structure, or dimer. It was thought that the two EGFR components sat on the membrane 'back-to-back' such that the sites of the bound EGF molecules were held far apart from each other. To investigate this model further, the experimental team carried out fluorescence studies in which the growth factor was first labelled with a fluorescent dye. This allowed them to measure the distance between the EGFs bound in the dimer. To their surprise, they found that the distance was much smaller than expected for the back-to back arrangement.

Largescale computational simulations are helping biologists to unravel the molecular mechanisms that control how normal and cancerous cells proliferate





A molecular graphic showing a tetramer complex of two pairs of EGFRs (blue and purple, and red and orange) sitting in a cell membrane and bound to EGRs (yellow). It shows how the EGRs can be held close together

Subsequent computer modelling at CSE was able to demonstrate that the receptors could interact head-to-head so that the bound EGFs were held closer together as indicated by the fluorescence studies. One interpretation is that the receptors might come together in fours, as tetramers, as shown in the graphic above.

To probe these structures in more detail, the CSE's supercomputers were put to work, carrying out molecular dynamics simulations on various configurations that the receptor complexes could form. These simulations start with the static structure, pieced together from X-ray crystallography results, which gives the coordinates of all the atoms, and then looks at the forces holding the structure together, calculating how the atoms vibrate or rotate over a few hundred nanoseconds. In this way, the simulation gives an indication of how the complex behaves and what its most stable formations are. Molecular dynamics simulations which included the cell membrane confirmed results from the fluorescence studies that the dimer can sit on the membrane in two different configurations, lying flat or standing proud from the surface.

What the studies have shown so far is that the way in which the four receptors interact is extremely complicated; they may act in concert or alone. The anticancer drug Herceptin works by binding one member of the receptor family but no-one is sure how it works. Possibly it inhibits the dimerisation process; however, there is still clearly a lot more to find out.

The HPCx supercomputer at STFC Daresbury Laboratory which was involved in carrying out the molecular dynamics simulations on the epidermal growth factor receptor (EGFR)

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More than 60 per cent of the UK population will die from either heart failure or cancer. Survival often depends on early and accurate diagnosis and treatment. However, both diseases have complex patterns of development that vary from patient to patient. To understand better the changes that happen during, for example, tumour growth or a heart attack, an international consortium of biomedical and computer scientists, the Integrative Biology Project, has come together to develop an advanced computer-based strategy for visualising the heart and tumours. The aim is to show structural changes at the scale of cells, tissues and the whole organ – in real time and in three dimensions.

A better body image

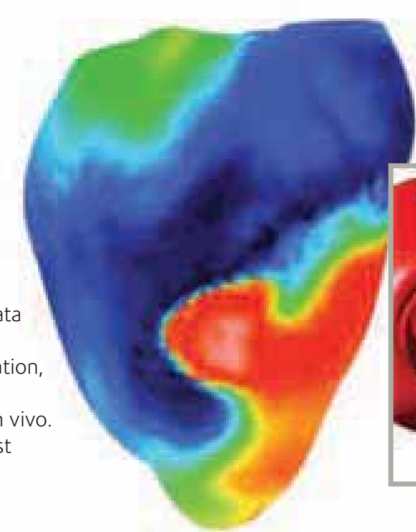
Until now, even the most advanced computer models of the heart were too simple to be clinically useful as they did not show the precise anatomical details of the ventricles, or the fibres making up the cardiac muscles. The onset of the arrythmia characterising a heart attack involves complex dynamic changes in these structures at the cellular and tissue level. If these processes were better understood and could be visualised immediately, clinicians could implement the correct treatment quickly and save more lives.

e-Science offers a new way of visualising organs quickly and accurately

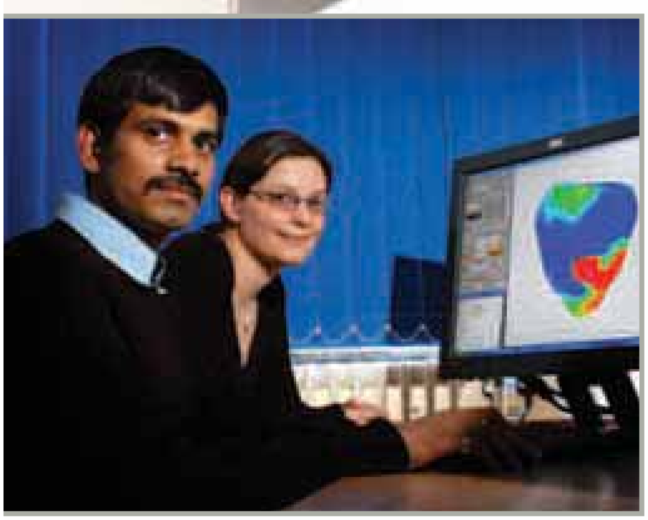
A consortium, involving UK, US, Dutch, Austrian and New Zealand partners, is harnessing the extraordinary power of Grid-based computing, whereby processing is distributed across interconnected clusters of computers, to create much more detailed and accurate models of the heart and tumours. In the case of the heart, the data are obtained from many tissue sections, which give accurate anatomical information, and combined with magnetic resonance imaging (MRI), which reveal processes in vivo. When uploaded into the system, the vast amount of information obtained can be processed and rendered by specially designed graphics software to give a high resolution three-dimensional image in real time. In this way, the image can be rotated, even though the data have to re-processed with each visual orientation. Users can then simply access the model from their desktop computer or laptop.

And now, the virtual heart

As part of this project, Lakshmi Sastry of the STFC Rutherford Appleton Laboratory produced a visualisation of a rabbit heart, involving half a gigabyte of data, from 1,440 MRI slices, using the UK National Grid Service. In recognition of its innovative approach and usefulness, she was awarded first prize in a recent showcase competition run by the UK's visualisation support network, VizNET.



The 2007 VizNET Showcase first prize has been awarded to the e-science centre's Dr Lakshmi Sastry for her distributed, high resolution visualisation of the rabbit heart using commodity cluster and open source software stack. The visualisation was developed as part of the Integrative Biology project



Above: Srikanth Nagella and Katie Weeks working on the Integrative Biology Project

Left: Visualisations of a rabbit heart

A prototype Integrated Biology Grid is now being installed at the University of Oxford, which will be able to handle the 10-fold increase in data needed to model the much larger human heart. "Ultimately, the goal is to transform the computer model into a useful clinical tool," says Dr Sastry. Information for a patient's particular condition would be fed into the model and compared with that for a normal healthy heart.

Other researchers are looking at visualising bowel tumours. Colorectal cancer is one of the biggest killers of men in the UK. It is often virulent, spreading rapidly. Images showing the growth pattern of the cancer over time will help doctors in devising the correct treatment.

The long-term goal of the project is to apply this approach universally to biological systems in the body including subcellular processes. The applications will be wide-ranging, from testing new drugs – perhaps reducing the need for animal experiments – to planning surgical and other types of clinical intervention.

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A new analytical technique reaches the hidden parts of materials that other methods cannot reach

What lies beneath

Shining light at, or through, materials provides a powerful way of finding out what they contain. Atoms and molecules respond in characteristic ways to light of specific wavelengths, leaving their telltale imprint on the transmitted or reflected light beam, to create a spectrum typifying the material's composition. Spectroscopy, particularly at infrared or near infrared wavelengths, is one of the main tools used in chemical analysis.

These techniques are usually carried out on transparent samples – often in solution, or on surfaces. Probing deep within opaque substances such as milky liquids or powders without damaging their integrity is less easy. However, researchers at the STFC Rutherford Appleton Laboratory have now developed a new variant of an old technique that can do just that. It promises to have a wide range of applications, from non-invasively detecting concealed liquid explosives, through checking the production quality of pharmaceutical products, to the non-invasive detection of disease.

The basic method is called Raman Spectroscopy. It employs a laser beam which impinges on the sample and is absorbed and scattered by the constituent molecules. The scattered light comes out at a slightly different wavelength, which relates to the molecular structure and gives unique spectral signature. Normally, if the beam is shone onto an opaque sample, the signal scattered back is overwhelmingly from its surface. Nevertheless, a small amount of the laser light does penetrate into the bulk. However, after making its way back out of the sample, this weaker scattered light is 'outshone' by the surface backscattering so is typically impossible to detect.

Using the STFC's laser facility, researchers developed an ingenious method that would separate out the signals coming from the bulk while avoiding the interfering surface signals. As the laser light returns from ever deeper layers, it gradually diffuses sideways from the vertical line marking the original incident laser spot, and so can be collected from regions that are laterally offset. The aptly named 'Spatially Offset Raman Spectroscopy' (SORS) can be used to identify signals from defined layers in a sample several millimetres deep.

Applications

The SORS technique is now being applied in several fields. One obvious application is in security screening. The ban on carrying liquids in hand luggage onto aeroplanes might not be necessary if suspect containers could be analysed chemically on the spot with a hand-held laser probe. Tests have shown that SORS can detect hydrogen peroxide – a constituent of home-made explosives used by terrorists – even when concealed in a typical plastic cosmetics jar. SORS also has the advantage that it works in the presence of water – unlike the similar technique of

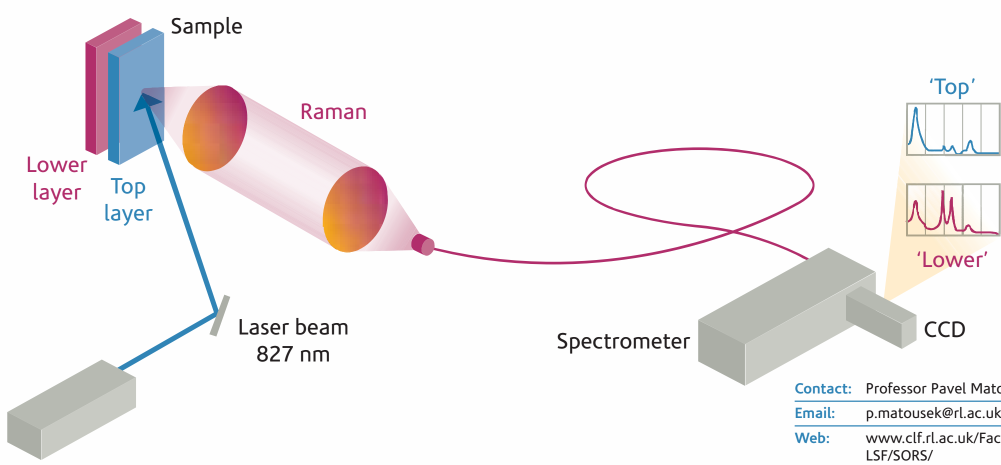
infrared spectroscopy in which the signal from water absorption completely dominates the spectrum.

A more commercial use is as a quality control tool in pharmaceutical production. SORS, when used in transmission mode (the light is collected from the other side of a sample) is effective in monitoring the chemical purity of tablets and capsules quickly and accurately. The technology promises to be inexpensive and more sensitive than other competing techniques. It could also be adapted to testing foodstuffs, paints and other everyday materials.

SORS is also capable of characterising living tissue safely. The research team has two major programmes to develop the technique as a clinical diagnostic tool. One is in collaboration with University College London to detect bone disease through soft tissue, and the other with Gloucestershire Royal Hospital to diagnose breast cancer by looking for signs of calcification of breast tissue.

The SORS technique has been developed in close collaboration with STFC's knowledge-transfer technology arm CLIK, and is being commercialised through the spin-out company LiteThru Ltd.

Professor Pavel Matousek and Dr Kate Ronayne developing Spatially Offset Raman Spectroscopy (SORS), a revolutionary technique capable of investigating tissue beneath patients' skin on the analysis of pharmacueticals without removing them from their capsules



The SORS method is based on a simple concept. Instead of collecting Raman light from the regions of a sample illuminated by the laser beam where the maximum signal is present, the scattered light is collected from regions that are laterally offset. This offset signal contains much lower relative Raman and fluorescence contributions from the surface layer allowing the signals of individual layers to be identified and seperated from each other

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Hydrogen, the most abundant element in the Universe, rarely exists alone in nature. Embedded in water, fossil fuels, and all living things, hydrogen must first be extracted before it can be used as a form of energy. This means that hydrogen is not an energy source; like electricity, it is a carrier – a means for transmitting energy from primary fuel sources to users. Often referred to as 'the ultimate fuel', hydrogen can be stored, it never runs out and emits no carbon dioxide (CO_2) making it much more attractive than fossil fuels and more appropriate for many applications than electricity.

Fuelling the

Hydrogen – a fuel of the future than can deliver environmental benefits today

Courtesy BP

Like electricity, hydrogen must be produced and transported. Today, nearly half the hydrogen produced is derived from natural gas but 'greener' methods are under development (see page 19).

Environmental benefits

Fossil fuel combustion by electric power plants, vehicles and other sources is responsible for most of the harmful particulates in the air today. The reduction in emissions proposed by governments is unlikely to resolve the problem alone.

Fuel cells are significantly more energy-efficient than combustion-based power generation and emit no harmful pollutants; hydrogen fuel cells powered vehicles use 40 to 60% of the fuel's energy compared to only 30% with internal combustion engines. Using hydrogen in very high efficiency fuel cells for transportation and power generation could significantly reduce greenhouse emissions. Equally important, weaning the world away from rapidly depleting fossil fuel supplies will limit CO_2 emissions further, reducing the effects of global warming. Where hydrogen is produced from renewable sources it will lead to zero emission power.

A key question facing the energy industry, however, is how to produce, distribute, and store hydrogen cheaply enough to compete with gasoline at the pump. Sourcing suitably energy and cost efficient methods is problematic.

Courtesy Daimler

The only 'pollutant' emitted from hydrogen fuel is water (H_2O)

A room temperature hydrogen reservoir

In an international collaboration that stretches across Europe, the United States and Asia, Professor Bill David from the STFC ISIS facility may have discovered a new class of materials that will bring us one step closer to solving the hydrogen storage issue. The first member of this new family, a combination of lithium, boron, nitrogen and hydrogen, is a carbon-free version of ethane. The material contains a huge amount of hydrogen – indeed the hydrogen density is higher than hydrogen itself. A block of this new material stores over 10% of its own weight in hydrogen at room temperature and only needs to be heated up to 92°C to release pure hydrogen gas.

How does the new material measure up to current storage solutions? Compressed hydrogen systems only store 7 to 8% of their own weight; the process is costly and the high pressures required introduce significant safety issues. Liquid hydrogen is another option but requires the gas to be cooled

Courtesy Daimler

future


Courtesy Daimler

SAFETY

Some people speculate that hydrogen is too dangerous to be safely used for fuelling cars. Hydrogen is, in general, neither more nor less hazardous than other fuels. In some respects it is safer than liquid fuels as it emits very little heat and, when spilled, hydrogen simply escapes upward leaving no hazardous puddles.

International standards ensure the safe production, storage, transport, and use of hydrogen. Just like petrol, we will have to learn how to use it safely.


Courtesy Daimler

THE CHICKEN AND THE EGG

Hydrogen fuel does pose a 'chicken-and-egg' type conundrum. Automotive companies are reluctant to manufacture direct-hydrogen fuel cell cars if the required infrastructure required is not available but energy companies are reluctant to invest in infrastructure if not enough vehicles require the new services. Luckily, some fuel companies are tackling this problem by collaborating with vehicle manufacturers to ensure that these interdependent technologies are developed hand-in hand.

and stored at an extremely cold -253°C – this is a costly process that requires expensive cryogenic storage tanks. On the other hand, storage of this new family of materials will result in systems with not much more weight than an average petrol tank and will be significantly safer than compressed gas or cryogenic options. Five hundred cycles of this material would take a car over 200,000 km. And that's the one real snag – the material gives off hydrogen easily but recharging is not straightforward – it is the hydrogen equivalent of a AA battery. The big challenge is to make just one member of this new class of materials reversible.

In the long term, perhaps in twenty to fifty years, the switch to a hydrogen economy will end the world's reliance on imported oil. As its use increases, this energy supply may result in dramatic social and economic changes. With the potential to remove the traditional differences in wealth between areas with or without easy access to energy sources, hydrogen provides an insurance against the vagaries of oil prices, and, importantly, it has the possibility of being a significant component in the creation of a more stable global economic climate. Ultimately, however, universal panaceas are seldom easily attained and the speed of change towards a hydrogen economy depends on market demand and political will, the real driving forces that will determine the fuel of the future.

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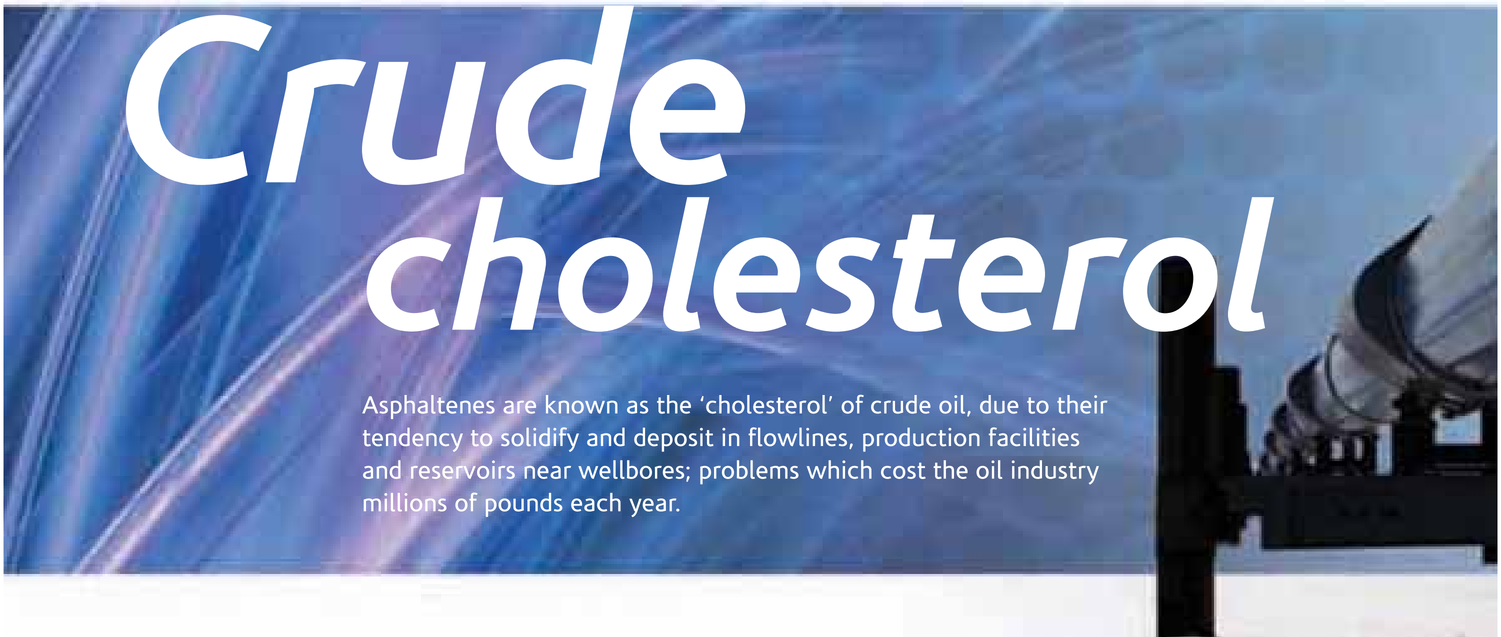
Revealing costly 'cholesterol' in the veins of the oil industry

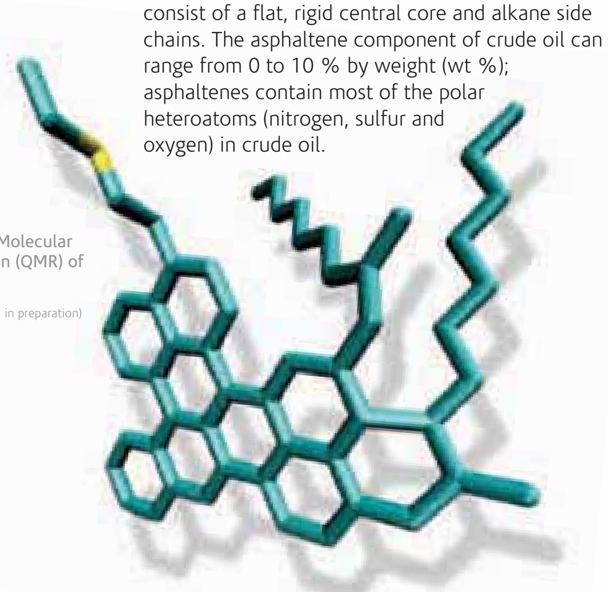


Crude cholesterol

Asphaltenes are known as the 'cholesterol' of crude oil, due to their tendency to solidify and deposit in flowlines, production facilities and reservoirs near wellbores; problems which cost the oil industry millions of pounds each year.

Asphaltenes, amongst other components of crude oil, are thought to be responsible for wetting alteration of oil reservoirs. The surface of the rock which holds oil is initially water-wet, i.e. there is a thin layer of water separating the crude oil from the rock surface. Asphaltene molecules are thought to diffuse through this layer changing the rock surface from water-wet to oil-wet, increasing the amount of oil that is retained in the reservoir thus reducing well productivity. Asphaltenes can also act as surfactant molecules stabilising unwanted water in oil emulsions.

Consisting primarily of carbon, hydrogen, nitrogen, oxygen, and sulfur, as well as trace amounts of vanadium and nickel, the molecular structure of asphaltenes has been under debate for a number of years but there is now agreement that they consist of a flat, rigid central core and alkane side chains. The asphaltene component of crude oil can range from 0 to 10 % by weight (wt %); asphaltenes contain most of the polar heteroatoms (nitrogen, sulfur and oxygen) in crude oil.



Quantitative Molecular Representation (QMR) of asphaltine

(Boek, Headen et al, in preparation)

Aggregating properties

When asphaltenes are in solution there is some aggregation on the nanometer (10^{-9} m) scale. These 'nanoaggregates' occur due to stacking of the central 'aromatic' core which stops after only a few molecules due to interference from the alkane side chains. The size of nanoaggregates varies from approximately 4 to 15 nm in diameter, however, despite intense research, the shape of the nanoaggregates and the driving force behind their aggregation are poorly understood.

Clays occur in a significant proportion of sandstone rocks and are also found in many asphaltene deposits. As asphaltenes are known to adhere to mineral surfaces, a team of researchers from University College London and Schlumberger Cambridge Research (SCR) wanted to discover exactly how the clay surface could enhance asphaltene aggregation to produce the larger nanoaggregates but they were far too small to be studied using conventional optical microscopy – small-angle neutron scattering (SANS) was required.

Dr Tom Headen and colleagues found the equipment they needed at the world's leading pulsed neutron and muon source, ISIS, based at the STFC Rutherford Appleton Laboratory. The LOQ instrument, a small angle scattering diffractometer, was ideal for measuring the shape and size of nanoaggregates. With assistance from the ISIS Facility combined with funding from the Natural Environment Research Council (NERC) and SCR, they would be able to study asphaltene nanoaggregation both experimentally and via computer simulations.

Courtesy BP

In order to optimise the resolution of data obtained using LOQ, Dr Headen decided to use deuterated solvents (in which the normal hydrogen atoms have been replaced by deuterium atoms) to enhance the contrast between the solvent and the hydrogenated asphaltenes. Synthetic laponite clay was chosen as its well-defined platelets would simplify data analysis, and asphaltenes were extracted from a Canadian heavy oil.

With all the ingredients in place, experimentation could begin. After collecting SANS spectra from samples of 1wt % asphaltene in solvent, a second sample of 1wt % asphaltene in the presence of laponite clay was analysed.

Analysis of the shape of asphaltene nanoaggregates is complex as they are a polydisperse system (the particles are of various sizes and shapes). To overcome this problem, the team used shape independent analysis. This revealed that not only do the dimensions of asphaltene nanoaggregates increase with decreasing temperature but the size of nanoaggregates also increases in the presence of the clay. The team now hope to confirm these results by 'contrast matching' the clay to the solvent, effectively making it invisible to neutrons.

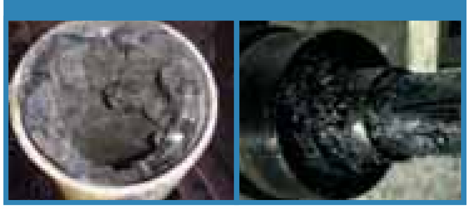
Through the curiosity and innovation of UK scientists, the morphology and behaviour of crude oil 'cholesterol' may finally be revealed. This vital knowledge will be of immense benefit to the oil industry, not only helping it predict and perhaps control asphaltene precipitation and deposition, but also dramatically reducing production costs, which ultimately could yield positive returns for the economy and the consumer.

Courtesy BP

THE AILMENT OF OIL

Problems involving asphaltenes are increasing due to the extraction of even the heaviest crude oils, as well as large amounts of light fractions from crude oil through thermal refining processes. Problems include:

- *Recovery* – wellbore clogging and deposition in pipelines.
- *Refining* – degraded asphaltenes are less soluble.
- *Blending* – mixing fuel oils may destabilise asphaltenes.
- *Storage* – sedimentation and clogging; increased polarity may cause aggregation.
- *Emulsions* – a high degree of water contamination may result in emulsion formation, asphaltenes may be responsible.
- *Preheating* – preheating fuel oils prior to burning encourages the precipitation of asphaltenes and coking.
- *Combustion* – 6% asphaltenes in fuel causes ignition delay and poor combustion, resulting in boiler fouling, poor heat transfer and corrosion.



Courtesy BP

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A new space mission steals a side-ways look at the Sun's stormy outbursts

Solar action in STEREO

In October 2006, the twin spacecraft of NASA's STEREO mission successfully set off to study the Sun. Now travelling in convoy with the Earth – one satellite ahead of our planet and the other behind – STEREO's unique double set of instruments is not only able to image the turbulent solar surface and atmosphere in 3D, but also to offer the first ring-side views of the vast clouds of charged matter that sporadically burst out of the Sun into the inner Solar System.

These coronal mass ejections, or CMEs, which travel at more than a million kilometres an hour and contain billions of tonnes of charged gas, are of interest to scientists and the public alike. If they reach Earth, they can disrupt telecommunications and cause severe power outages, as well as posing a serious radiation hazard to spacecraft and astronauts. Until now, it has been almost impossible to detect the eruption of a CME that might be coming towards Earth, and to track it through the inner Solar System. Most important, it has been impossible to predict whether it is likely to hit the Earth.

The UK instruments

The UK-led instruments on the STEREO probes will provide some answers. The Heliospheric Imagers (HI-A and HI-B, one on each spacecraft) were built, and are being operated, by scientists from the STFC Rutherford Appleton Laboratory and the University of Birmingham. These wide angle telescopes are designed to observe the region of space between us and the Sun from out of the Sun-Earth line, and can follow a CME as it moves through the Solar System. The observations enable scientists to measure its mass and direction of travel, and to map its evolving structure as it balloons into space. Research teams are also interested in the effects of CMEs on Solar-System objects such as comets and the inner planets. Many of the measurements involve coordinating complementary observations made with other solar and planetary missions, and ground-based instruments.

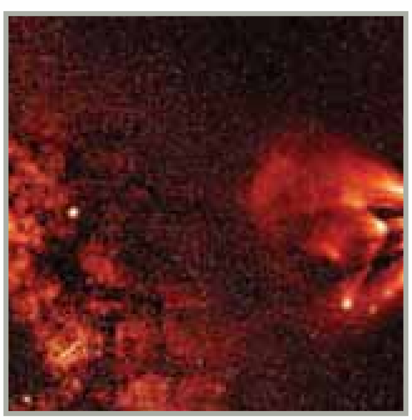
The HI scientific operation phase of the instruments started in April 2007, and is already producing spectacular results – some of them quite unusual. A growing number of UK research groups, including the Universities of Aberystwyth, Central Lancashire, Southampton, the Open University, Imperial College London, the Mullard Space Science Laboratory and the Rutherford Appleton Laboratory, are now involved in analysing the data. Events observed include two CMEs which hit Venus and were followed using additional data from instruments on the Venus Express spacecraft now orbiting the planet. The HI instruments also recorded the first ever collision of a CME with a comet, in which the CME completely tore off this icy body's characteristic tail of charged gas particles. The instrument on the probe positioned ahead of the Earth (HI-A) also captured a sequence of images showing in remarkable detail the tail of one of the brightest comets seen in the past 40 years.

To obtain images of objects like comets and CMEs, the raw data must be processed to remove the interfering 'noise' of scattered light from interplanetary dust particles surrounding the Sun. A spin off of this extraction is that it has also allowed scientists to map this dust corona in the innermost Solar System for the first time. Even though the Sun is only just out of the HI instruments' fields of-view, they are designed such that negligible sunlight seeps into them. This means that images clearly show the Milky Way in the background, with distant stars hundreds of times fainter than can be seen with the naked eye.

The first-ever image of a collision between a CME and a comet which resulted in the comet's tail being ripped off

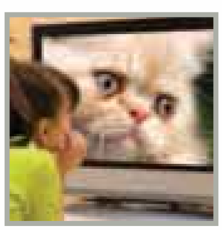
The brilliant Comet McNaught as seen by HI-A

An HI image of a CME, also showing Venus (bottom left) and Mercury



An image of a CME crossing the inner Solar System, along with the Milky Way; Jupiter (left) and Antares (alpha-Scorpio) are on the lower right

Courtesy Dreamstime



Because the instruments can monitor these stars continuously for long periods of time, researchers are also attempting to look for extrasolar planets by measuring the variability of the stellar light. They also hope to study the low-frequency vibrations of red giants, which would provide information about the internal structure of these aging overblown stars.

STEREO is deemed a great success: the 3D ultraviolet images taken by US-led instruments reveal the great swirling loops of magnetically trapped matter at the Sun's surface. At the moment, the spacecraft are too close together to see the much larger CMEs in genuine stereo; the spacecraft Sun-Earth angle in each case is currently about 50 degrees. However, they are gradually moving apart, widening the angle that the Sun makes with the two spacecraft by 22.5 degrees a year. Towards the end of 2008, we can expect to see amazing 3D images and movies of CMEs as they head into space.

The Sun can adversely affect the magnetic field (the magnetosphere) that protects the Earth from high energy particles from outer space, enabling more of them to pass through the atmosphere. High energy particles can affect radio signals, cause power cuts and disrupt radio communication between Earth and spacecraft (including satellites which would affect GPS, mobile phones, television, etc.). The results obtained from the STEREO mission will help scientists to predict solar output better, determine its potential impact on the Earth's climate and help to limit its adverse impact on daily life.

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Polarised neutrons uncover the secret of a well-known pigment's colour

Electrons are the glue that binds atoms together in a material. Properties such as colour, hardness, conductivity or chemical reactivity depend on the exact location and mobility of these bonding electrons. Obtaining detailed information about their behaviour is therefore essential in developing novel materials and devices needed, for example, for future sustainable-energy production or the next generation of computers.

Why is Prussian blue

Unfortunately, this is not an easy task because conventional methods of studying electronic properties – X-ray scattering, resonance or spectroscopic techniques – are complicated by experimental difficulties and the ambiguity of data they produce. However another type of analysis using beams of neutrons can provide the information required. These subatomic particles behave as waves, and so, when reflected by materials, produce characteristic scattering patterns just as X-rays do.

Neutrons have a particular advantage: they have a spin which imparts a magnetic moment. This makes them sensitive to the magnetic moments of single electrons (which also have spin) in a material, so they produce a magnetic scattering pattern. Although the electrons are usually paired with spins oppositely aligned so their magnetic moments cancel each other, some materials have an atomic or molecular structure containing unpaired electrons. These lone electrons can confer a range of important properties: the ability to store or transfer energy or information; they may make the material magnetic or give it a certain colour.

A powerful way of studying these characteristics is to use beams of 'polarised' neutrons with all the spins aligned. These then interact with the unpaired electron spins to give a magnetic scattering pattern that reveals their positions. However, providing an intense-enough source of polarised neutrons over a wide range of wavelengths has been a problem. A few years ago, a UK team developed a new polarisation technique at the Institut Laue-Langevin neutron facility (ILL) in Grenoble, France (which the STFC supports, along with the complementary ISIS spallation neutron source at the Rutherford Appleton Laboratory). The method is based on spin-polarised helium^{-3} gas which absorbs neutrons of one spin type, effectively acting as a spin filter. It can be used with both the ILL and ISIS neutron sources, even though they generate neutron beams in a different way such that they have different characteristics.

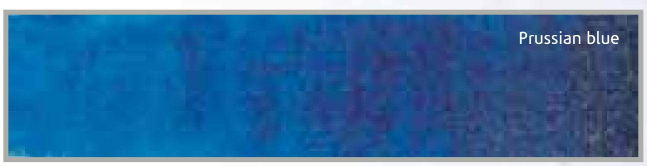
Locating lone electrons

Researchers at University College London have been using polarised neutrons produced with the spin filter to study a pigment called Prussian blue, or ferric ferrocyanide. Known since the early 18th century, this complex and rather insoluble iron-containing compound was the first synthetic colour to be made; it was made accidentally by Heinrich Diesbach in 1704 from ox blood and potash. The material's intense blue colour led to its use as a pigment in carbon paper and typewriter ribbons. Derivatives of Prussian blue were employed in early photographs known as cyanotypes because they were sensitive to light; and in engineering they became known as 'blueprints'.

Today, the pigments have been re-explored because they offer a mechanism by which light can be used to control chemical and magnetic properties, a key property for optical computing and new information technologies. The basic

The Institut Laue-Langevin in Grenoble

blue?

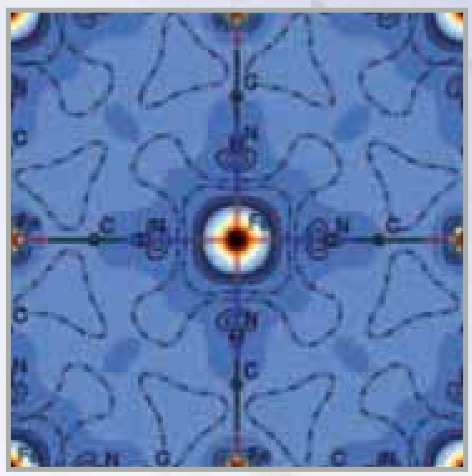


Prussian blue

process is to be found in Prussian blue itself. The blue colour is the result of light being absorbed when single electrons are transferred between iron atoms in the molecular structure.

The polarised neutron experiments were able to give an accurate map of where these unpaired electrons are. Theoretical calculations calibrated with this information revealed that the electron transfer process is not simple: the locations of the unpaired electrons, and consequently colour, is in fact determined by defects in the structure and the water molecules consequently introduced.

Probing the magnetic properties of electrons in this way promises to be a powerful tool in not only in developing new materials with technologically important properties, but also in exploring biological systems, where electron-transfer is a key step in energy capture and production.



Comparison between experimental and predicted unpaired electron densities in Prussian blue

Prussian blue may offer key properties for optical computing

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Most crystalline solids are known for their highly ordered, rigid structures, which behave in expected ways – expanding when heated, contracting when cooled. However, some inorganic materials appear to be less predictable. For example, crystalline zirconium tungstate actually shrinks on heating (negative thermal expansion, NTE) – and when subjected to high pressures, it changes into a glassy, or amorphous material (pressure-induced amorphisation, PIA).

Inside zirconium tungstate

X-rays and neutrons reveal why some crystals crumple under pressure

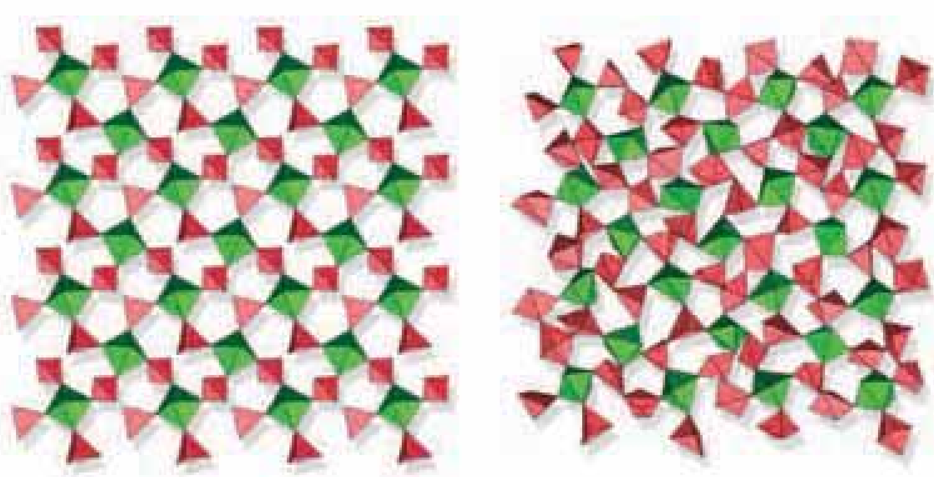
These thermodynamic renegades are interesting not only in terms of understanding how changing temperature and pressure can alter structural behaviour, but also because they have potential technological applications.

In zirconium tungstate, the clue to understanding both NTE (negative thermal expansion) and PIA (pressure-induced amorphisation)lies in its molecular structure (ZrW_2O_8). It consists of a network of zirconium and tungsten atoms linked via 'bridges' of oxygen atoms (see below). However, one of the four oxygens attached to each tungsten atom is not involved in forming these bridging links, and so can 'waggle' about. The overall structure is therefore somewhat flexible. This means that when heated, the increased vibrations cause the structure to buckle and contract, resulting in NTE.

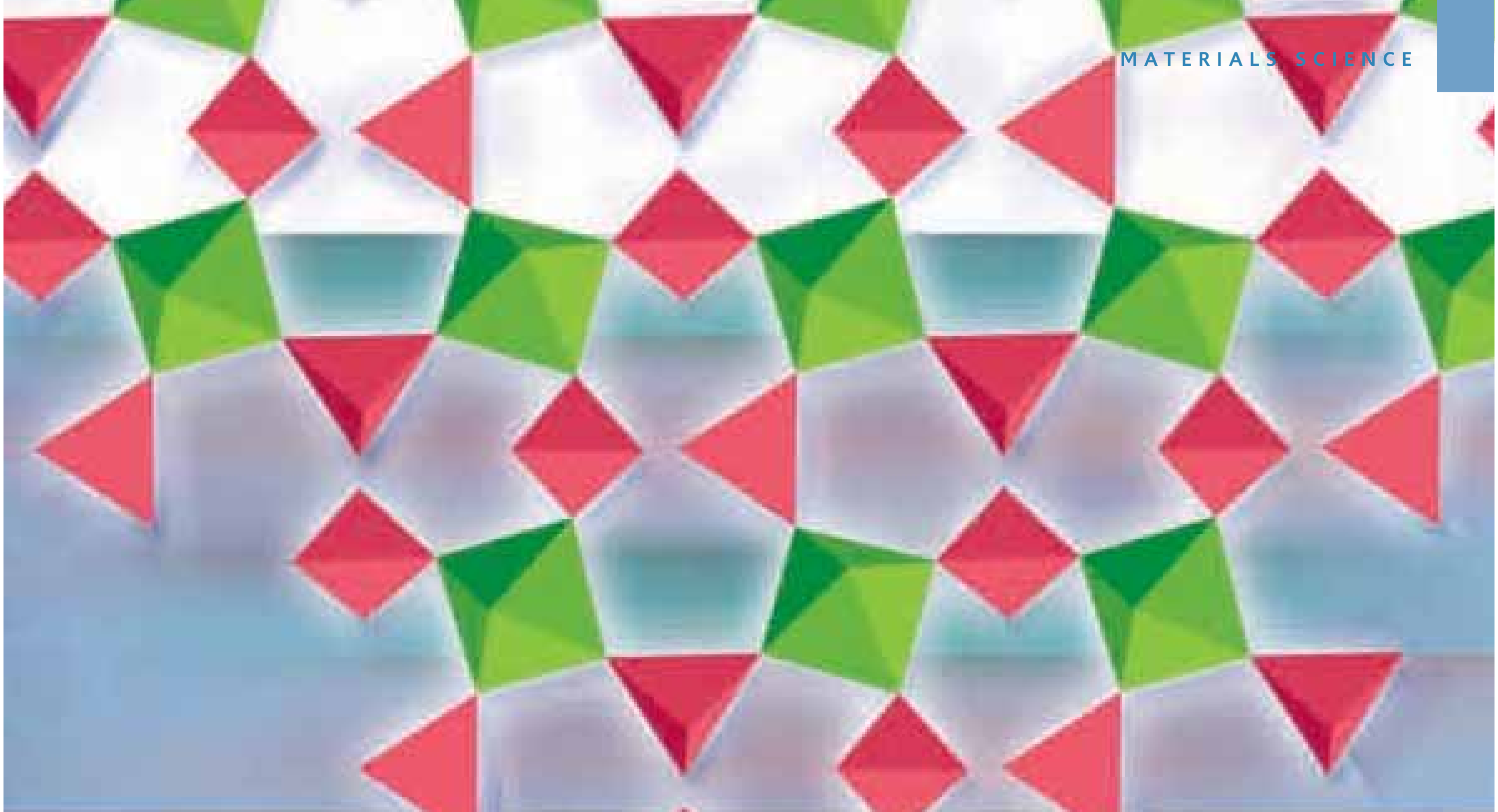
What happens when pressure is applied has, however, been less clear. People were not sure whether the structure collapses completely into a glassy state of random molecules, perhaps breaking up into a mixture of zirconia and tungsten oxide, or whether new bonds form to create a more complex structural phase.

Complementary experiments

To find out more, a team of researchers from the STFC Rutherford Appleton Laboratory, and the Universities of Cambridge and Durham, decided to investigate the PIA in zirconium tungstate via diffraction experiments at the ISIS neutron scattering facility and at the European Synchrotron Radiation Source (ESRF) in Grenoble France. The high-energy X-ray beams available at the ESRF



A section of the crystalline structure of zirconium tungstate (left) showing zirconium-oxygen (green) and tungsten-oxygen subunits (red) linked at the corners via bridging oxygens. The amorphous model (right) shows the structure of the PIA material which has some similarities to the crystalline form but is denser and has more bonds



(which is supported by the STFC), together with neutron beams at ISIS, can provide highly complementary information about the structures of crystals and glasses. When X-ray or neutron beams scatter off ordered arrays of atoms, they produce a diffraction pattern characterised by so called Bragg peaks. X-rays are particularly sensitive to heavy atoms like tungsten and zirconium, while neutrons more easily detect lighter atoms like oxygen. From the combined diffraction data, researchers can work out the distances between all the atoms, and therefore the overall crystal structure.

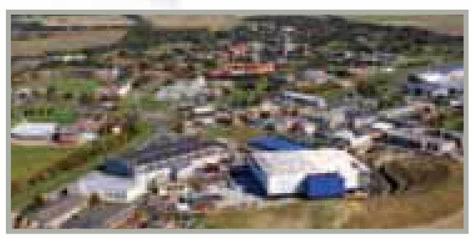
The experiments involved placing samples in a pressure cell and gradually compressing them in a series of steps. At each step, they were removed and diffraction measurements made until they showed that the Bragg peaks had disappeared, which indicated that the material had become amorphous. This happened between pressures of 1.5 and 3.5 gigapascals (a gigapascal is about 10,000 atmospheres).

To interpret the results, the diffraction data were compared with predictions derived from calculating what happens to the structure as the atoms move together under compression. The team concluded that the non-bridging oxygen atoms formed additional, new bonds in a rather random way to produce a denser, disordered material, but that the zirconium-oxygen bonds were unchanged resulting in some remaining overall order. This meant that the amorphous material formed under pressure was not quite the same as the glassy state normally obtained by melting and rapidly cooling the crystalline form.

As well as throwing light on zirconium tungstate's inner changes, the results are relevant to other materials showing similar anomalous behaviour under pressure. Minerals which have a porous structure such as zeolites can also show PIA and the transition to an amorphous state is thought to be the underlying structural change in a germanium-antimony-tellurium alloy (Ge_2Sb2Te_5) used in rewritable DVDs.

Of even more significance is the role of PIA in the structural behaviour of common geological materials; quartz and ice both show PIA under the kinds of pressures found deep in the Earth. Such transitions would affect the thermal properties of the planet, and thus our broader understanding of the environment.

ESRF, Grenoble



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When we look up at the stars at night, we see only the visible light they emit. However, a large part of the Universe reveals itself at invisible infrared wavelengths. Examples include far-flung galaxies that are galloping away from us so that their emitted light appears increasingly stretched into the infrared with distance; star-forming regions shrouded in dust which obscures visible light but not infrared radiation; and small wizened stellar objects that are not hot enough to emit in the visible but gently glow at longer wavelengths.

When is a star a planet?

Since 2005, the UK's dedicated infrared telescope, UKIRT, on Hawaii has been deployed in a wide-ranging programme to scan the sky systematically, penetrating deep into the centre of the Milky Way and beyond into the Cosmos. Making use of the telescope's high-tech wide-field camera, WFCAM, built at the STFC UK Astronomy Technology Centre in Edinburgh, the UKIRT Infrared Deep Sky Survey (UKIDSS) is mapping vast volumes of space both near and afar, and in many directions. In early 2008, the UKIDSS team released its first tranche of data to the world. The observations will provide astronomers with a rich source of observations for many years to come.

A unique infrared sky survey is hunting down 'mini-stars' that look like Jupiter

Brown dwarf hunt

One of the goals of the survey is to hunt for very small, cool stars called brown dwarfs. Stars are formed from large clouds of gas and dust which collapse under gravity, becoming hot and dense enough to trigger nuclear reactions and start radiating light. Stars can have a range of masses, but below a certain weight, they fail to achieve nuclear ignition; they start off moderately hot but slowly cool down over time. These brown dwarfs have masses ranging between those of normal stars and large gas planets like Jupiter. (The star-brown dwarf boundary lies at 80 times the mass of Jupiter; the Sun has a mass 1,000 times that of Jupiter). Brown dwarfs were predicted 40 years ago but their existence was not confirmed until the 1990s.

Today, hundreds of brown dwarfs have been discovered, and have been classified into two spectral types, one covering surface temperatures between 2,000 and 1,200°K and the other, with temperatures below 1,200°K. Their atmospheres contain dust and water vapour, and in the coolest objects, methane as well. As the brown dwarfs get cooler, the more their composition resembles that of giant gas planets, and astronomers are keen to find where the boundary lies between these cold stellar objects and planets.

In May 2007, UKIDSS found a new type of brown dwarf that has come closer to that threshold. Called ULAS J0034-00 and estimated to be about 50 light years away, it has a temperature of only 600 to 700K – cooler than any previously detected brown dwarf by 100K – and a mass 15 to 30 times that of Jupiter. Spectroscopic studies carried out in conjunction with the UK-supported Gemini South Telescope in Chile confirmed that the object was the first of a new class of very cool brown dwarfs.

Image of the brown dwarf J0034, made from UKIRT data

Fisheye lens view of the Wide Field Camera at the United Kingdom Infrared Telescope (UKIRT) with the telescope dome open, at sunset just before the start of a night's observations

Courtesy Paul Hirst, Joint Astronomy Centre

An artist's rendition comparing brown dwarfs to stars and planets. Left to right – limb of the Sun, a very low mass star, a hot brown dwarf, a cooler brown dwarf and the planet Jupiter. All four of the low-mass objects are approximately the same size, ten times smaller than the diameter of the Sun. Their masses range from 1,050 times that of Jupiter (for the Sun) through 75, 65, 30, and 1 Jupiter mass for the star, hot brown dwarfs (hot then cool), and Jupiter, respectively

The same comparison seen by eyes sensitive to near-infrared light

The discovery of these low-mass stellar objects is helping astronomers to build a census of the full range of star masses across the Galaxy. Measuring this so-called mass function gives important clues to the nature of star formation and galactic evolution. Statistical models suggest that brown dwarfs are more common than their more massive relatives; however, only those relatively near to our Sun are likely to be detected. The coolest brown dwarfs are a million times less luminous than the Sun, and emit all their light in the infrared, so it is feasible to detect them out only to about 100 light years away, while bright stars can be seen right across the Milky Way which is 100,000 light years across. (An object 1,000 times further away is 1 million times fainter. Alternatively, an object a million times less luminous can be seen to a distance 1,000 times shorter).

The survey is only one-third of the way through and, we can expect UKIDSS to identify many more brown dwarfs, and even cooler examples. The survey is already furnishing new data on the millions of young stars in the plane of the Milky Way, as well as on the hundreds of thousands of very distant galaxies seen as they were not long after the birth of the Universe in the Big Bang. UKIDSS will be releasing data every 6 months until the survey is completed in 2012.

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Our Milky Way is a spiral galaxy – it includes a disc, around a central hub, that contains swirling arms studded with tens of billions of stars at various stages of evolution. More stars are being born from clouds of dust, mainly in clusters, in dense star-forming regions. Other stars are coming to the end of their lives having burnt all their nuclear fuel; they puff off their outer layers, shrivelling to become tiny white dwarfs. As this happens, some will enshroud themselves in beautiful glowing shells of gas and dust known as planetary nebulae.

A rose-tinted view of

UK astronomers are carrying out the first comprehensive digital search for young and old stars in the Milky Way

In 2003, a group of UK astronomers set up a collaboration to carry out a comprehensive high-resolution survey of the Galactic disc, seeking out these earliest and last stages of stellar evolution. The IPHAS (INT/WFC Photometric H-alpha Survey of the Northern Galactic Plane) consortium released its first public catalogue of some 200 million objects at the end of 2007. It provides important data about stellar populations and how they are spread out across the plane of the galaxy.

The survey, performed using the Wide Field Camera on the 2.5 metre Isaac Newton Telescope on La Palma in the Canary Islands, looks at the red light emitted by ionised hydrogen gas across the Northern skies. This so-called H-alpha emission is a marker for star-forming nebulae and the planetary nebulae of dying stars, and can be used to map their distribution. Able to see stars right to the outer edge of the Milky Way, the survey has detected and distinguished a wide variety of star types that are up to a million times fainter than can be seen with the naked eye. The observations confirm that, as expected, most star formation is occurring in the densest part of the galactic disc,

Isaac Newton Group of Telescopes from Roque de Los Muchachos peak, La Palma

the galaxy

Dust lanes in the Rosette Nebula

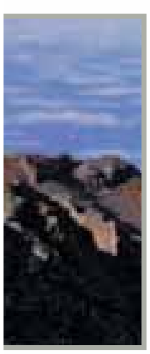
and that the distribution of these young stars follows the disc's bent shape or 'warp' caused by the gravitational tug of nearby galaxies.

Mapping the Milky Way

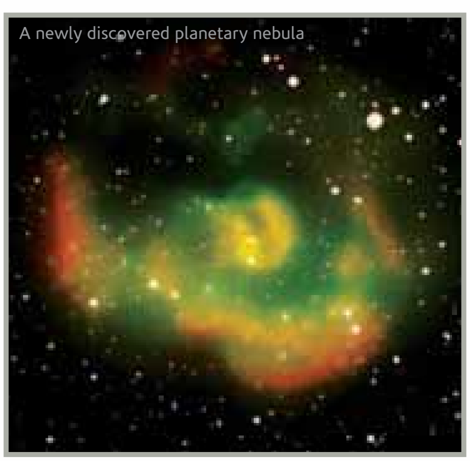
Astronomers will use the survey data to home in on particular objects for further study – to find out, for example, how gas clouds collapse into stars and how clusters of young stars then evolve. In addition to finding young and old stars, IPHAS has been able to determine the distances to ordinary stars in the galactic plane, partially obscured by dust, and measure the degree of reddening of their light due to this obscuration. This approach enables us to build a spatially well-resolved three dimensional map of how dust is distributed within the galactic disc. This mapping will complement future projects to study galactic structure and stellar demographics such as ESA's Gaia space mission to be launched in 2011.

The IPHAS datasets are being made available through the UK's AstroGrid Virtual Observatory, whereby the data can be accessed and analysed remotely across a shared computer interface. The datasets can be combined with various kinds of observations and cross-referenced with other relevant data catalogues. The Virtual Observatory is a powerful new concept, and this survey is the largest so far to be accessed in this way.

In the next few years, the southern sky galactic plane will also be surveyed, using the Very Large Telescope (VLT) at the European Southern Observatory's Cerro Paranal Observatory in Chile. Astronomers can thus look forward to having a complete three-dimensional map showing the life and times of stars in our home galaxy.



Courtesy Nik Szymanek



A newly discovered planetary nebula

Nick Wright, University College London

The Wide Field Camera

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Understanding the atomic

UK physicists are constructing a novel, highly sensitive detector for studying rare exotic atomic nuclei

Atomic nuclei make up most of the visible matter in the Universe, including ourselves. They consist of positively charged protons and neutral neutrons tightly bound together by fundamental forces. The number of protons characterises the atoms of each element in the Periodic Table; each element can have varying numbers of neutrons giving rise to isotopes. Protons and neutrons bind in many different nuclear combinations – well over 6,000 – most of which are fairly unstable. Nevertheless, their configurations are highly complex, and sometimes rather mysterious. The structure of nuclei is of great significance in not only understanding how the forces of nature work but also how the elements were created.

An AGATA detector unit of three germanium crystals

Physicists devise ingenious experiments for probing nuclear structure. These require large scale facilities with particle accelerators set up to create beams of novel nuclei, which are then detected and studied in various ways. Increasingly, the aim is to make beams of short-lived exotic species with significant or extreme ratios of protons to neutrons.

These rare species may reveal why certain proton-neutron combinations are more stable than others, or have particular shapes. They may shed light on how the elements are built up in stars, thought to happen via processes involving nuclei that are unusually rich in neutrons or protons. Another goal is to make massive nuclei with as many protons as possible in pursuit of discovering new super-heavy elements.

An important method of studying these nuclei is to collect the gamma rays emitted when they decay, or when they are excited into a higher energy state by a laser or a collision with another particle. The characteristic spectrum of gamma ray energies reveals much about the energy levels in the nuclei, the arrangement of protons and neutrons, and the overall shape of the nucleus.

An advanced gamma ray detector

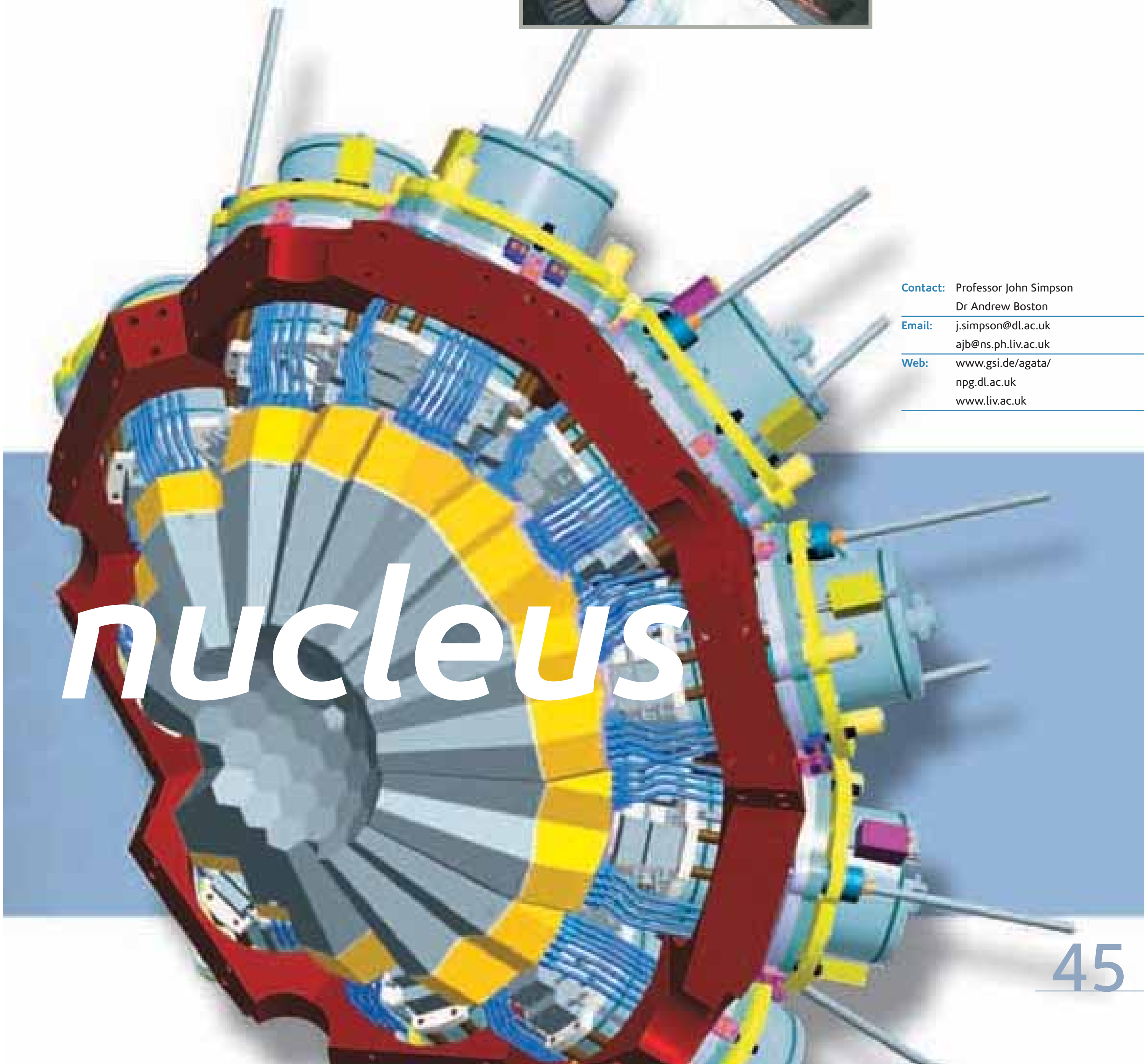
Detecting gamma rays from just a handful of transient exotic nuclei requires a new level of highly sophisticated spectroscopic instrumentation. UK nuclear physicists have pioneered the development of gamma ray spectrometers, and now teams from the STFC Daresbury Laboratory in Cheshire and the University of Liverpool, as part of a new European wide collaboration, are constructing a new spectrometer that will be 1,000 times more sensitive than previous detectors. "The UK is responsible for the overall design and is heavily involved in the generation of the electronic digital data acquisition system," says Professor John Simpson who leads the Daresbury team and is the overall AGATA project manager.

The Advanced Gamma Tracking Array, AGATA, is being built by more than 40 partners from 12 countries. Like previous gamma ray detectors, it consists of a spherical, segmented array of germanium crystals, each about the size of a baked-bean can. However, AGATA differs in that the germanium detectors fill up the entire sphere, which dramatically improves the detector's sensitivity. The paths of the gamma rays, as they bounce around inside the detector, can be reconstructed using state-of-the-art computer methods. This enables the researchers to record both the position and energies of all the gamma rays reaching the detector.

The first phase of the project, which is a demonstrator detector of 15 germanium crystals, will be completed in 2008 and tested at various nuclear research facilities across Europe. Further UK teams, from the Universities of Manchester, Paisley, Surrey and York, will join in work leading to the completion of the full detector array of 180 crystals by 2015.

The work will also have important spin-offs in devising more efficient gamma ray detectors for medical imaging and diagnosis using radioactive tracers, such as Positron Emission Tomography (PET). Work is already in hand to develop portable radiation monitors based on the technology, which could be used by security services to detect dirty bombs, and also to monitor radioactive waste.

Positron Emission Tomography (PET), a powerful medical imaging technique, is used in the diagnosis of diseases such as cancers, brain malfunction and heart disease



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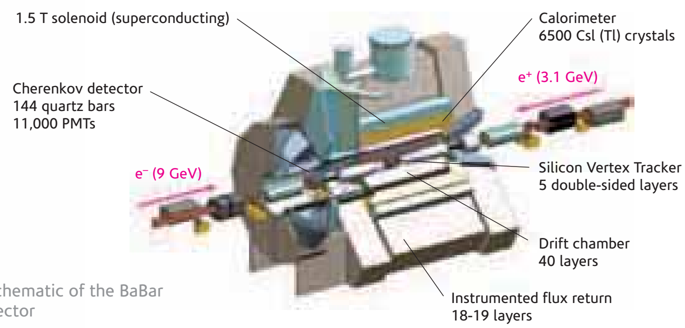
BaBar takes a bow

A highly successful experiment measuring the difference between matter and antimatter is finishing with a flourish

For the past nine years, an international team of 600 physicists and engineers, including groups from the UK, has been collecting and analysing the wealth of data pouring forth from the BaBar experiment at the Stanford Linear Accelerator Center (SLAC) in California. The results have firmed up our current understanding of fundamental particles – the Standard Model – in particular predictions about the small differences between the behaviour of matter and antimatter.

According to the Standard Model, matter is made of two kinds of basic building blocks, quarks and leptons. There are six quarks of increasing mass called up, down, strange, charm, bottom and top. The lightest two, up and down, make up the protons and neutrons comprising everyday matter, while the others are seen only at high energies. The much lighter leptons include electrons, muons and tau particles, and their neutrino partners. Each particle has an antimatter version with opposite properties such as electric charge (*C*) and direction of spin, or parity (*P*).



A schematic of the BaBar detector

All the particles were thought to have been generated in the incredibly high-energy environment existing just after the Big Bang. Both matter and antimatter particles would have been created in equal amounts, and so a crucial question arises as to why there is very little antimatter around today. Particle theorists suggested that there were subtle differences between the behaviour of some particles and their antimatter partners – known as CP-violation – which could account for disappearance of antimatter.

The principal task of BaBar was to establish CP-violation in short-lived particles called B-mesons which consist of a bottom quark bound to an up or down quark, and the antimatter versions, B-bar mesons (hence the name BaBar). CP-violation would result in a difference in the rates at which the two particles decay. The effect is tiny, and so to see it millions of B and B-bar decays must be recorded in the giant BaBar detector. The B-mesons are produced in collisions between beams of electrons and anti-electrons, or positrons, whose energies have been tuned to maximise B-meson production. SLAC's PEP-II accelerator which produces the beams is known as a 'B-factory'.

Quark mixing

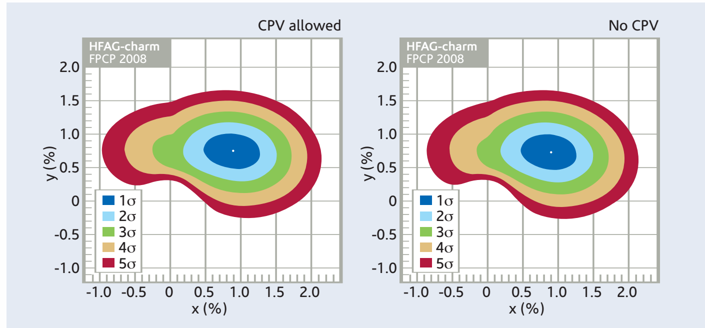
As well as measuring the lifetimes, particle physicists have been scrutinising every aspect of the particles' decay patterns as a way of testing the Standard Model as thoroughly as possible. The degree to which the particles 'mix', such that a quark can change into its antimatter partner is an important test, and has also been measured.

Over the years, PEP-II's performance has been tweaked to produce ever more electron-positron collisions. This has allowed the BaBar collaboration to hunt down other particles that are rarely produced and study their behaviour. In

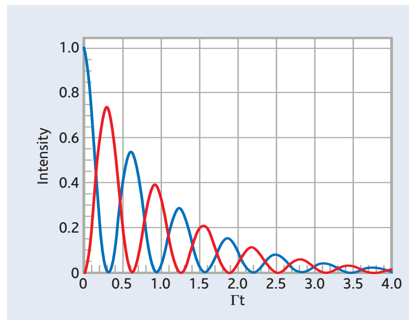
2007, it found the first evidence of a long-predicted but very rare mixing-process in charm mesons (containing a charm quark and an up or down quark). Mesons can convert into their antipartners and back again, and this type of mixing had been already seen in mesons containing bottom and strange quarks. For charm quarks, this process is so rare that, of the 1.2 million charm and anticharm mesons studied, only about 200 showed evidence of mixing. The teams also measured CP-violation in charm mesons.

So far, all the results – the levels of CP-violation and quark mixing – seem to comply with the Standard Model predictions. While this is good news in confirming the established particle explanation, particle physicists would have liked to have seen hints of something more. A slight deviation from the predicted CP-violation measurements or in the degree of mixing would have pointed to new phenomena going beyond the Standard Model that would require theories giving a deeper explanation of Nature. To see anything more unusual, physicists will now have to wait for the much higher-energy LHCb experiment on the Large Hadron Collider at CERN, which is due to start in 2008. Two other experiments similar to BaBar, but generating 100 times more data, are being planned: SuperKEKB in Japan and Super-B, possibly in Italy. If approved, they will start sometime in the middle of the next decade. These new B-factories will be complementary to LHCb and offer an exciting prospect for pursuing the physics further.

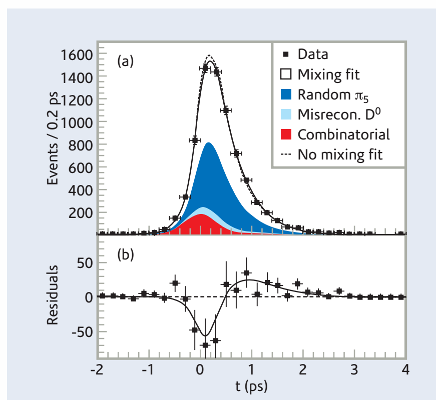
In the meantime, although the BaBar teams stopped taking data in April 2008, they will be sifting through the billions of particle events recorded for several years to come, looking for other phenomena such as rare decays of tau particles not allowed by the Standard Model. The BaBar story is still far from over.



Above: A plot of the world average for the two variables that measure charm meson mixing. The measured value in the centre of blue circle is more than 5 sigma away from (0,0) indicating that mixing has been observed



Left: An illustration of mixing. Starting in a pure charm meson state, as time goes on it mixes into its antiparticle. The exponential decrease is because both mesons decay to other particles



Left: The original result from BaBar of the measurement of the decay of a charm meson. This shows the number of charm mesons or anti-charm mesons measured versus time. The dashed line is what we would expect if there was no mixing, and the solid line is what is obtained if allowing for mixing. The plot at the bottom shows that the fit with mixing (solid line) goes through the points while the fit without mixing (flat dashed line) does not

Courtesy SLAC

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with charm

Diamond

Two new complementary detectors at the UK's national light source, Diamond, will take high speed X-ray 'videos' of the structures of complex, everyday materials

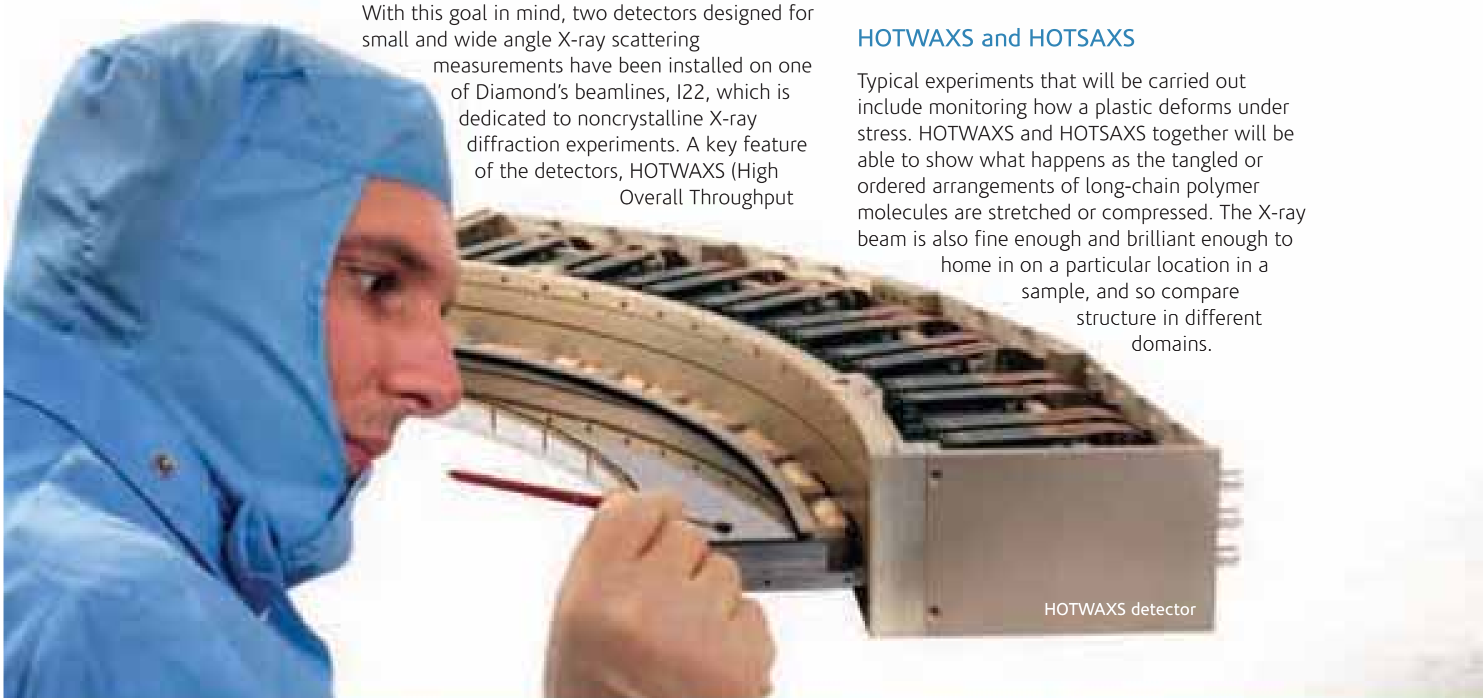
Diamond is a world class facility which generates extremely brilliant beams of light at wavelengths ranging from infrared, through ultraviolet to X-rays. The beams are guided down a series of beamlines to experimental areas where researchers can analyse a wide range of materials at the atomic and molecular level. One of the key methods of analysis is X-ray scattering, whereby X-rays impinging on a sample produce a diffraction pattern that relates to the sample's microscopic structure. The X-rays scattered at wide angles give information at atomic scales of less than half a nanometre, while those at small angles reveal broader molecular architecture over larger scales up to several micrometres.

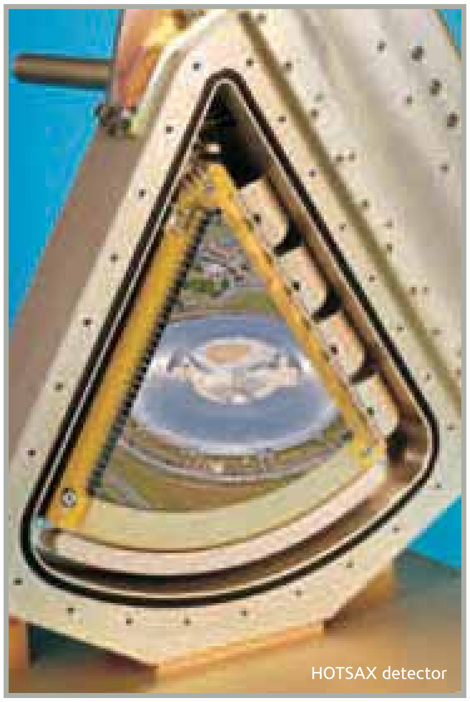
By combining wide angle and small angle X-ray scattering, researchers can study the structure of a material over a range of length-scales. This is particularly useful for studying samples comprising several components organised in complicated or hierarchical ways such as wood, ceramics or plastics, or large, intricately arranged biomolecules such as proteins in solution.

With this goal in mind, two detectors designed for small and wide angle X-ray scattering measurements have been installed on one of Diamond's beamlines, I22, which is dedicated to noncrystalline X-ray diffraction experiments. A key feature of the detectors, HOTWAXS (High Overall Throughput Wide Angle X-ray Scattering) and HOTSAXS (High Overall Throughput Small Angle X-ray Scattering), is that they can count the scattered X-rays coming in very quickly – equivalent to a video camera taking a million images a second. This will allow users to follow structural changes in a sample as they actually happen, over periods from microseconds to several minutes.

HOTWAXS and HOTSAXS

Typical experiments that will be carried out include monitoring how a plastic deforms under stress. HOTWAXS and HOTSAXS together will be able to show what happens as the tangled or ordered arrangements of long-chain polymer molecules are stretched or compressed. The X-ray beam is also fine enough and brilliant enough to home in on a particular location in a sample, and so compare structure in different domains.


HOTWAXS detector


HOTSAX detector

An important role for Diamond is to provide information on the three-dimensional structures of proteins, which is vital for understanding disease and developing new drugs. Experiments using the new detectors can offer additional information by highlighting the overall conformation of the protein in its natural watery environment. Eventually, it should be possible to watch a protein as its long chain of amino acids folds up into its characteristic, and functional, three-dimensional shape.

These kinds of experiments are feasible because HOTWAXS and HOTSAXS employ the same detection system, ensuring that the complementary information they give is equivalent. They are based on gas microstrip technology in which the incoming X-rays ionise the gas in small chamber; an avalanche of charged particles then travel towards a series of metal electrodes on a glass sheet, under the influence of an electric field, to create an electrical signal. The detectors are flexible, in that the gas, usually dimethyl ether mixed with argon or xenon, can easily be changed over depending on the X-ray energies being measured. Their configurations are not exactly the same, however: the shapes are slightly different to accommodate the differing scattering geometries. Furthermore, to measure scattering at small angles, HOTSAXS has to be much further away (up to 10 metres) from the sample than HOTWAXS.

The detector technology, which was developed at the STFC Rutherford Appleton Laboratory, is now being commercialised with the aim of selling similar detectors to other light sources around the world. In the meantime, Diamond's duo will be ready for experiments in the summer of 2008. The I22 beamline is joined by the nine others which are now being commissioned or optimised.

Diamond, which was officially launched in October 2007, is already producing results from the first seven beamlines commissioned as part of Phase I of development. The I22 beamline is the first of 15 more Phase II beamlines that will be installed in the coming years.

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gets real

The world's largest scientific project is almost ready for action

The final countdown for the LHC

2007 has been a momentous year for what is the world's most important experiment exploring the basic nature of the Universe. The final components of the Large Hadron Collider (LHC), being built at Europe's particle physics laboratory CERN in Geneva, have gradually been placed in position, and various systems tested. During 2008, the LHC will start up, colliding beams of protons at unprecedented energies in a 27 km underground circular accelerator.

This titanic machine follows in the remarkably successful footsteps of CERN's previous particle accelerators. These machines, together with others in the US, discovered and confirmed our current picture of the building blocks of matter in terms of fundamental particles and forces. However, this 'Standard Model' is not complete; there are unanswered questions: how do particles get their mass, and how did they come into existence in the first moments of creation; what is the difference between matter and antimatter that can explain the preponderance of matter we see today; and what are 'dark matter' and 'dark energy' that appear to dominate the Universe?

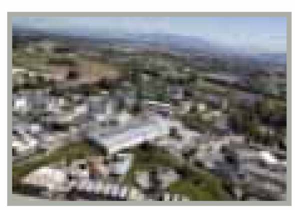
The LHC will provide some answers, and test the many theoretical speculations that go beyond the Standard Model. International teams will search amongst the products from the 600 million proton collisions a second for signs of new particles, such as the famed Higgs boson and dark matter particles, as well as extra spatial dimensions and other new phenomena that will give us a deeper understanding of reality.

The LHC project has been a long time in the making. For two decades, particle physicists have been making preparations for this extraordinarily complex machine and the experiments it will carry out. It has involved more than 10,000 physicists and engineers in 37 countries working on the accelerator and infrastructure, and the myriads of components of the four main detectors, ATLAS, CMS, ALICE and LHCb. UK teams have been at the forefront of designing and making many of the subdetector, magnet and computer-processing modules. They will also be involved in analysing the torrent of data (equivalent to 100,000 DVDs every year) that will pour forth for the next 15 years, once the LHC switches on. Much of the technology developed, such as novel detectors

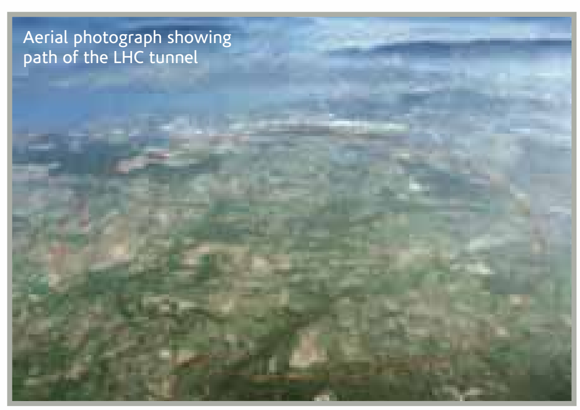
The last of 1,746 superconducting magnets is lowered into the LHC tunnel

Courtesy CERN

Aerial view of CERN

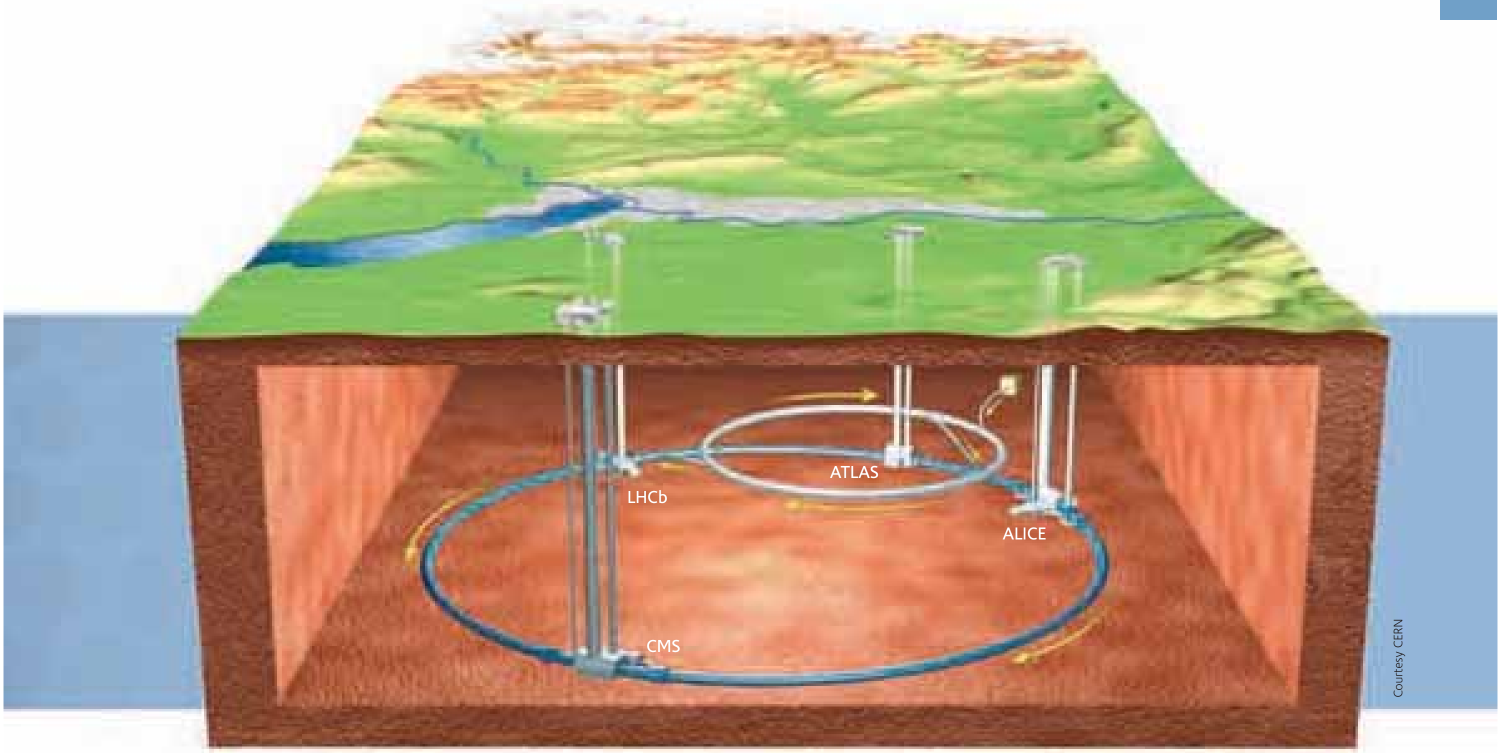


Courtesy CERN



Aerial photograph showing path of the LHC tunnel

Courtesy CERN



This computer-generated image shows the location of the 27 km LHC tunnel (in blue) on the Swiss-France border. The four main experiments (ALICE, ATLAS, CMS, and LHCb) are located in underground caverns connected to the surface by 50 to 150 m pits. Part of the pre-acceleration chain is shown in grey

and the distributed computing network (the Grid) developed to deal with the data deluge, is already being applied in other areas such as medicine.

Detectors now in place

The past year has seen the giant detectors reach the stage at which they are ready for commissioning. Each detector consists of distinct layers comprising various types of detecting elements which, together, can give complete information on the particle collisions. ATLAS and CMS are two general-purpose experiments aimed at detecting a wide variety of phenomena; their configuration is thus hugely complex. ATLAS has slowly been assembled in its vast underground experimental cavern over several years. During 2007, the two end-cap magnets, each weighing 240 tonnes, and the final 140 tonne modules of the muon spectrometer were installed. The construction of CMS has been carried out in a different and rather unusual way; it has been built above ground and then lowered, element by element, into the experimental hall 100 metres below. This was successfully completed in January 2008 when the final detector component weighing 1,430 tonnes was slotted into place.

The final element of the CMS detector is lowered into its underground experimental cavern

A welder works on the interconnection between two of the superconducting magnet systems in the LHC tunnel

At the end of 2007, the delicate silicon detector of LHCb was installed, and the whole system was tested out by detecting cosmic rays. LHCb is specifically designed to detect differences in the decays of particles and antiparticles containing b-quarks – one of the building blocks in the Standard Model. The results will not only probe the subtle differences between matter and antimatter but also on theories going beyond the Standard Model.

As well as producing proton collisions, the LHC will also collide beams of high-energy lead nuclei aimed at creating the fireball soup of quarks that existed just after the Big Bang. ALICE is designed to study the resulting exotic state of matter which eventually congealed into the particles we have today. The 10,000 tonne ALICE detector, too, is almost ready with all the heavy infrastructure now in place.

As well as the experiments, the eight sectors of the accelerator system have now been linked. Each sector contains around 200 superconducting magnets and a refrigeration system that cools the magnets to just above absolute zero. The systems have been tested and the final preparations for start-up are now ongoing. We can now look forward to some exciting science at the LHC.

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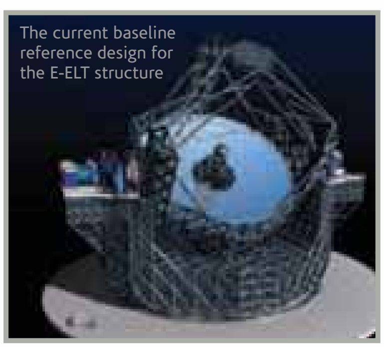
An EAGLE eye on the early Universe

A huge multi-channel spectrometer is being designed for the European Extremely Large Telescope (E-ELT) to tease out infrared light from the furthest galaxies in the Cosmos

The past decades have been a golden era for astronomical observations. Advances in technology have produced ever larger telescopes that can see far out into space – and therefore back in time – to epochs when the Universe was in its youth. They have been able to gather light from some of the earliest galaxies as they were just a few billion years after the Big Bang.

The images obtained with the current generation of instruments are too faint to show any detail, however, European astronomers are planning the design of a new, much larger telescope. With a 42 m mirror, it will outclass current 8 and 10 m instruments, offering at least 20 times more light gathering power. The E-ELT will be able to collect light from the first galaxies that formed and evolved, picking out their active star-forming regions and the giant black holes thought to exist at the heart of every galaxy. In nearer galaxies, the telescope will allow individual stars and stellar populations to be studied. In this way astronomers will be able to compile a complete history of galactic evolution.


The current baseline reference design for the E-ELT structure

Courtesy ESO

Collecting and focusing the incoming light into an image can give only part of the story. The light also has to be separated into its constituent wavelengths so that the emission and absorption lines associated with various elements such as hydrogen and oxygen can be identified. These spectral lines give information about the composition of galaxies and the generations of stars in which most of the elements were built up. Shifts in spectral lines also give a measure of distance, and the motions of stars and hot gases which drive the growth and destruction of galaxies.

The EAGLE spectrometer is being developed by a UK/French consortium to make these measurements on the E-ELT. Although the spectral features of interest are normally found in the optical part of the spectrum, those of distant galaxies will be shifted into the near infrared because of the expansion of the Universe. This means that the spectrometer must be designed to cover these wavelengths.

To obtain statistically-meaningful results for regions of sky containing thousands of galaxies, EAGLE will have the capability to analyse the light from many galaxies simultaneously. This is achieved by collecting light through 20 or more channels, each one processing the image of a different galaxy. Small moveable 'pick-off' mirrors sitting on the telescope's focal plane will each select a target object and send its light to a spectrograph.

Many mirrors make light work

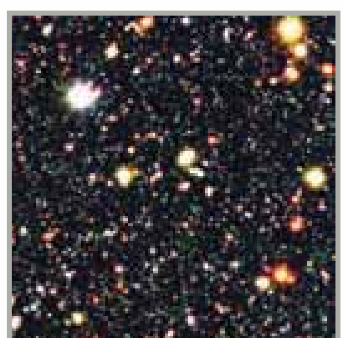
Of key importance is the ability to modulate the wavefront of the incoming light with a deformable mirror to counteract the blurring effect of atmospheric turbulence – adaptive optics. While the telescope will have a general adaptive optics system, to achieve a clear view of a single distant galaxy, EAGLE will have its own additional 'multi-object adaptive optics' (MOAO) set-up, consisting of a small deformable mirror for each channel.

When fully assembled, EAGLE will be roughly 5 m across and 5 m tall. The upper layer in this concept includes the focal plane, the pick-off mirrors, the integral field units and the spectrographs. Below this layer are the electronics and services needed to control and support the layer above

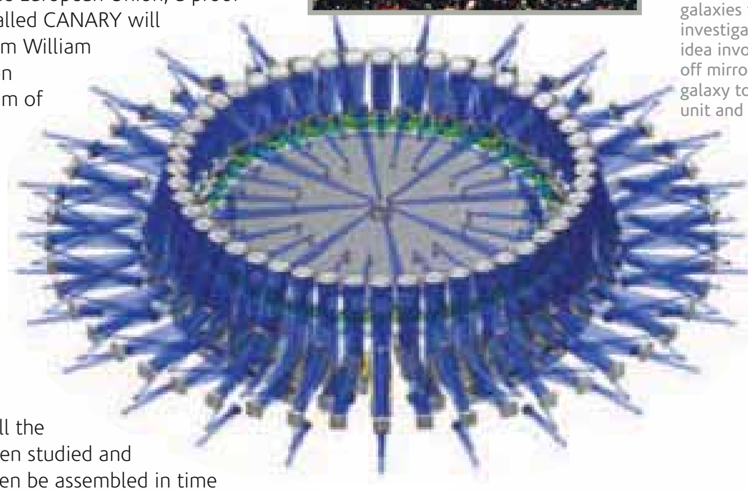
The corrected image is then chopped into one-dimensional slices, which are then lined up and fed onto a grating to disperse the light into a spectrum. The image slicers, or integral field units (IFUs), dissect the galaxy image into more than a 1,000 separate spatial elements, each of which produces a spectrum which can then be re-combined to give a complete three-dimensional spectral map of the galaxy.

While the IFUs have been used on other telescopes, MOAO is a new idea. With funding from the STFC and the European Union, a proof-of-concept system called CANARY will be tested on the 4.2 m William Herschel Telescope on La Palma, with the aim of being ready for demonstration by 2010. The telescope's mirror is appropriately one-tenth the diameter of that of the E-ELT, providing a suitable scale model of the final system.

Once the design of all the components have been studied and tested, EAGLE will then be assembled in time for E-ELT 'first light', currently scheduled for 2017.



The WHT Deep Field – an 7x7 arcminute patch of sky in the constellation of Pisces, observed with the William Herschel Telescope for about 70 hours. The picture is a 'true colour' composite of images taken at ultraviolet, blue and red wavelengths. Most of the objects are distant galaxies, although the very brightest ones are stars. This is one of the deepest images ever taken from the ground



Various options for selecting the individual galaxies from the E-ELT focal plan are being investigated. Shown here is a promising idea involving individual free-standing pick-off mirrors which direct the light of each galaxy to a deformable mirror, integral field unit and spectrograph

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Programming the appliance of high technology

The STFC provides strategic leadership and an integrated approach to the UK's investments in large research facilities at home and overseas. The Council supports and sustains UK academic and industrial research, ensuring it remains at the forefront of international quality research and development programmes.

The STFC is involved in many of the world's most exciting research programmes, including: hunting the missing dark matter produced during the 'Big Bang'; searching for signs of life on other planets through the Aurora space programme; investigating new energy sources through lasers and hydrogen fuel cells (page 30); monitoring the effects of climate change; advancing cancer treatment; and modelling the human heart (page 26). Many other programmes involving forefront research in particle physics, nuclear physics, the life sciences, materials science, astronomy and space science, are underway, all of which require access to state-of-the-art facilities and instrumentation.

The common thread of the STFC's programmes and facilities is high technology applied to science and engineering – the council develops, builds and operates technically complex equipment, literally making science happen. 2007-2008 has proven an exciting time for the Council resulting in major advances in facility development including: the opening of the Astra Gemini facility (page 57); development of the new ULTRA laser on the Lasers for Science Facility; completion of a £1.5 million upgrade of the high-resolution powder diffraction (HRPD) instrument at ISIS; significant developments in the ALMA project (page 56); the final pieces of the Large Hadron Collider being put into place at CERN (page 50); completion of the Scuba-2 camera for the James Clerk Maxwell Telescope in Hawaii (page 59); and launch of the New UK Light Source project (page 11).

The STFC is working to maintain and extend its scientific skill base and technology expertise, to support the future science base and make it the partner of choice for technological solutions. The complementary planned Futures Programmes (page 61) will further enhance the economic impact of the STFC's science facilities, programmes and technology, enabling maximum synergy between research, applications and industry.

Future developments

- **ISIS TS-2** – opening autumn 2008

  The ISIS Second Target Station (TS-2) will extend the world-leading ISIS neutron source by providing qualitatively different capabilities for research in soft matter, bio-molecular science, and advanced materials. 2007 witnessed a period of very intense activity; fast extraction kicker magnets were installed and the new proton beam line was completed, culminating with the successful delivery of protons to the target.


ISIS Second Target Station

- **ULTRA** – opening autumn 2008

  The ULTRA laser will be the world's most sensitive time-resolved vibrational spectrometer. This new facility will enable UK scientists to monitor biological processes at a millionth of a millionth of a second.

- **Neutrino Factory** – technology demonstration due 2011

  A neutrino factory will produce the most intense and focused beams of neutrinos ever achieved, with the ultimate goal of understanding whether neutrino properties can explain the origin of matter in the Universe. The international Muon Ionisation


Professor Ken Long and the MICE team at ISIS

Planning for the future

Cooling Experiment (MICE) collaboration is aiming to demonstrate technology required for the factory by building a short section of a muon cooling channel on the ISIS facility. Currently under construction, the cooling channel will be built over the next two to three years.

- **FAIR** – opening 2012

  The UK has a very active Nuclear Physics research community despite not hosting an accelerator of its own. The STFC is, therefore, participating in the development of the new European Facility for Antiproton and Ion Research (FAIR), which was 'launched' in November 2007 and will be constructed at GSI in Germany.

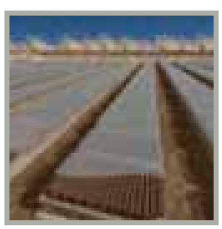
- **XFEL** – opening 2013

  The European X-ray Free Electron Laser (XFEL), based in Hamburg, Germany, will be a world-leading facility for the production of intense, extremely short pulses of X-rays for scientific research in a wide range of disciplines. Launched in June 2007, construction began in spring 2008. XFEL will open up new areas of research, such as the ability to track chemical reactions as they occur, and to map the electrons in molecules.


Undulator on XFEL

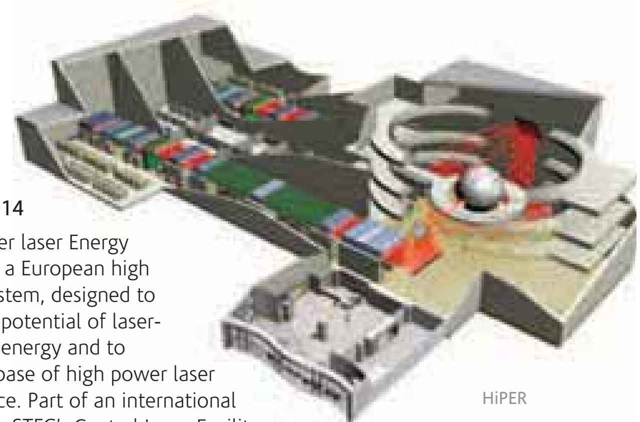
- **SKA** – construction decision around 2010-12

  The Square Kilometre Array (SKA) is a global project to design and build the next generation radio telescope in which the UK has a key role. With a collecting area of up to one million square metres spread over at least 3,000 km and a sensitivity 50 times higher than the world's currently most powerful radio telescope, SKA will tackle many of the most important problems in cosmology and fundamental physics.


SKA

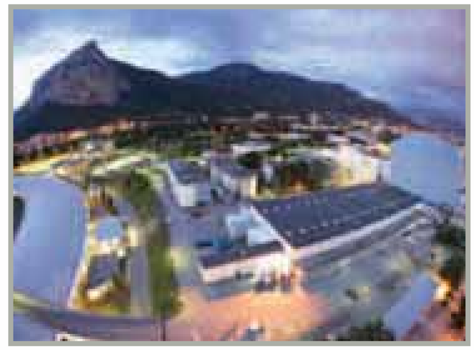
- **HiPER** – construction due to commence in 2014

  HiPER (High Power laser Energy Research) will be a European high intensity laser system, designed to demonstrate the potential of laser-driven fusion for energy and to support a broad base of high power laser interaction science. Part of an international collaboration, the STFC's Central Laser Facility is leading a three-year project to prepare the case for construction of the proposed HiPER laser facility and explore its future location.


HiPER

- **ILL Upgrade** – ongoing

  Recognised as the world's most productive and reliable source of slow neutrons for the study of condensed matter, the Institut Laue Langevin (ILL), is owned and operated by France, Germany and the UK, with STFC managing the UK's subscription. The Council has strongly endorsed the development of instruments within an upgrade programme to meet users' requirements; there is potential for UK industry to collaborate on their development.

ILL


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Reflections of the neutron guide installation team in the HRPD neutron supermirrors at ISIS

ALMA

Formation of a Supergiant

The pre-production cryostats at RAL

The Atacama Large Millimetre Array (ALMA) is an international collaboration, between Europe, North America and Japan, to construct and operate the world's largest radio telescope observatory. Located in the Atacama Desert of Northern Chile at an altitude over 5,000 m, ALMA will provide an unprecedented view of the Universe in the millimetre and sub-millimetre wavelength range enabling scientists to explore the clouds of dust and gas from which all the stars and planets in the Universe form. The facility will combine fifty-four 12 m diameter and twelve 7 m diameter telescopes to form a vast imaging array extending some 15 km across the desert terrain.

Following a period of successful prototype development, construction of ALMA has now entered a 'full-production' phase. Core elements of the observatory, including buildings and essential services, have been established during the year. The first antennas arrived in Chile in late 2007.

The STFC is a key player in the ALMA project. The Rutherford Appleton Laboratory (RAL) has been contracted by the European Southern Observatory (ESO), the ALMA funding agency within Europe, to supply: 45 cryogenic systems, required for cooling the detector electronics; 50 photomixing devices, essential for maintaining coherence of the array; and prototype calibration loads, necessary for calibration of the instrument.

RAL will also be host to a centre for ALMA detector assembly and testing – the 'European Front-End Integration Centre'. The centre will perform a vital and demanding task of integrating and characterising 50% of the ALMA receiver front-end detector systems, and delivering each assembled system safely to Chile.

In addition, during 2007-2008 further agreements with ESO related to the software requirements of the observatory were put in place. As a result, the Council is now also responsible for development of software essential to ALMA's science operations including: observation preparation tools; data handling and analysis; and data archiving. Expert teams within the STFC UK Astronomy Technology Centre and the University of Manchester have taken on the challenge of delivering the cutting edge software required to breathe life into this supergiant and uncover the secrets of the Universe.

In December 2007 two giant antenna transporters (measuring 10 m x 20 m x 6 m) were shipped from Germany to Chile; they arrived safely on 20 February 2008

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A vision of the near-future ALMA antenna array

Twin lasers reach a new power peak

Astra Gemini

The Astra laser system has been running successfully for eight years at a power of 20 terawatts (20,000 billion watts), producing ultra-short pulses only 40 millionths of a billionth of a second long.

Astra Gemini, a four year, £4 million upgrade of the Astra laser facility to a petawatt-class system, was completed in 2007. After a busy spring and summer establishing the performance of the Titanium-sapphire amplifiers and their neodymium-glass pump lasers, setting up the compressor hardware and optics, and optimising the compressed pulses ready for delivery to the experimental area, commissioning of the new equipment was finished. The first shot to target was fired on 29 September 2007, punching a hole in a piece of aluminium foil and generating a burst of X-rays and protons.

When focused, Astra Gemini produces the world's highest laser intensity and, for the fleeting moment of the laser pulse, its power is equivalent to 10,000 times the output of the UK National Grid. This new laser will increase the available intensity of the UK's laser-based research facilities by a factor of ten.

Ian Pearson MP, Minister of State for Science and Innovation, officially opened Astra Gemini during a visit to the Harwell Science and Innovation Campus on 28 November 2007.

Opened to the user community in January 2008, Astra Gemini is internationally unique. It offers twin beams, each working at half a petawatt and capable of firing a shot every 20 seconds. The beams can be configured in many different ways to enable scientists to carry out a broad range of experiments, including accelerating electrons to high energy, investigating the physics of the vacuum, simulating the conditions inside the Sun and recreating the birth of stars. Complementary to the Central Laser Facility's Vulcan petawatt laser, which can deliver more energy, but in a longer pulse and at a far slower shot rate, the high repetition rate of Astra Gemini will open up new ways of doing high-intensity physics to the scientific community.

Astra Gemini undergoing final tests prior to opening to users

> "This is an area in which the UK can rightly claim to be the best in the world… …this new laser facility, Astra Gemini… …will maintain the UK's leadership in this exciting area of science."
>
> Ian Pearson MP, Minister of State for Science and Innovation

First users on the Astra Gemini facility

Astra Gemini team, Professor Dave Neely, Martin Tolley, Dr Andy Ward and Bob Stevens looking through the target chamber

Schematic of Astra Gemini

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Diamond Light Source

In its first year of operation the UK's new synchrotron science facility, Diamond Light Source, was used by almost 700 scientists who have undertaken 101 experiments in a wide range of fields including biology, physics, chemistry, environmental science, planetary research, laboratory astrophysics, materials science, nanoscience, heritage conservation and archaeology. Demand has been high; the facility has been oversubscribed by a factor of three and 294 experiment proposals have been submitted since the start of operations.

Exceptional brilliance

Many technically challenging problems encountered during the construction and commissioning of the facility have been overcome to deliver Diamond on time, on budget and to specifications – a staggering achievement for a project of this scale and complexity.

Phase I comprised the building, the machine and the first seven experimental stations and, with this phase complete, the team has focused on optimising the facility for users (academic and industrial researchers) and developing strong support for the science undertaken. Work on Phase II beamlines has also been progressing to schedule and, by the end of 2008, six of the 15 Phase II beamlines will be operational.

The past year has also been one of celebrations with first research projects being undertaken and first results being published. In October 2007, Diamond had the honour and privilege of welcoming Her Majesty The Queen and His Royal Highness the Duke of Edinburgh to tour and officially open the facility.

These achievements have been made possible thanks to the funding and support Diamond has received from the Government, stakeholders and the academic community. The facility is a joint venture between the STFC and the Wellcome Trust. This unique partnership brings new impetus to how science is perceived and delivered within the UK, and Diamond's achievements simply reflect their ongoing support and commitment.

Although the majority of Diamond users will be drawn from the academic community, the facility can also be accessed by industry. As a national resource, Diamond must ensure that UK-based industry benefits from the latest techniques that the facility offers, techniques that represent powerful research and development tools. In December 2007, nine prospective industry users were invited to undertake test experiments and this trial has already resulted in Diamond signing contracts with seven customers.

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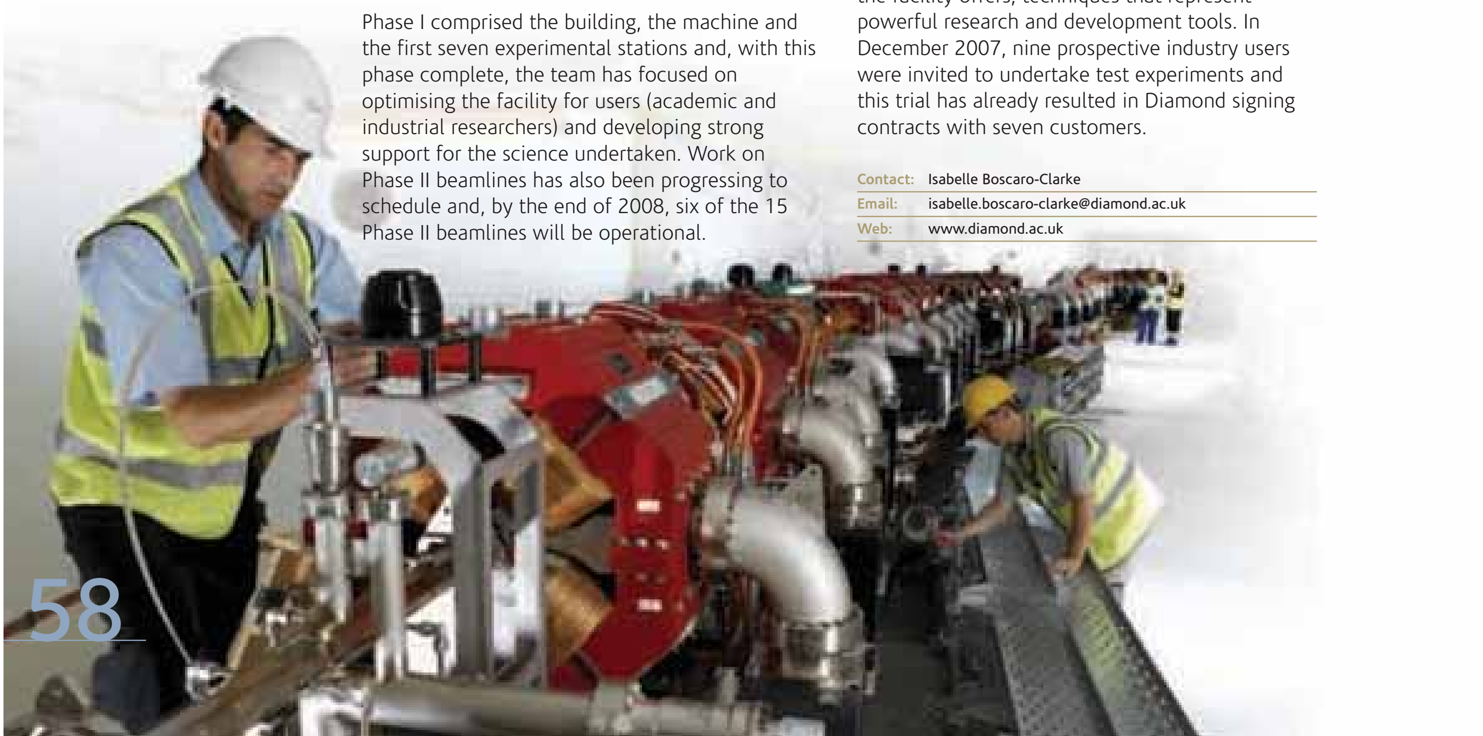


Revealing the mysteries of the Universe

SCUBA-2

UK researchers pioneered observations of the sky in the submillimetre wavelength-range (0.2 to 1 millimetre) with the groundbreaking James Clerk Maxwell Telescope (JCMT) on Hawaii. The SCUBA camera, installed on JCMT in 1997, revolutionised submillimetre observations, resulting in many discoveries – as exciting and important as the images made with the famous Hubble Space Telescope.

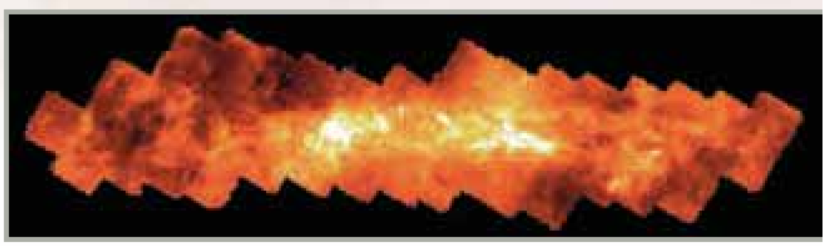
With a much larger field-of-view and sky-background limited sensitivity, SCUBA-2 will map large areas of sky up to 1,000 times faster than the current SCUBA camera. All areas of astronomy will benefit, from studies of our Solar System and surveys of protostellar complexes in the Milky Way, to answering key questions about the formation and evolution of galaxies in the early Universe.

SCUBA-2 represents a major innovation from current submillimetre instruments. Using state-of-the-art technology it will incorporate the first large-format 'CCD-like' camera for submillimetre astronomy. This dual-wavelength instrument will operate at both 450 and 850 mm simultaneously, using two large-format cameras built by the STFC UK Astronomy Technology Centre (UK ATC). The cameras are made of arrays of detecting elements (transition-edge sensors) cooled close to absolute zero. Made of a superconducting alloy, which conducts electricity without resistance below a precise, ultra-low 'transition' temperature, the sensors detect tiny changes in temperature caused by the influx of submillimetre radiation. The signals from each of the thousands of pixels in the arrays are then amplified using yet more superconducting technology – superconducting quantum interference devices (SQUIDS) – and then processed and combined to produce an image.

JCMT, Hawaii

The development of SCUBA-2 is a collaboration between the UK ATC, the US National Institute of Standards and Technology, the Astronomy Instrumentation Group at the University of Wales at Cardiff, the Scottish Microelectronics Centre at the University of Edinburgh, a consortium of Canadian universities and the Joint Astronomy Centre which hosts the JCMT. Following an intense period of assembly, integration and verification at the UK ATC in 2007, the instrument successfully passed customer acceptance tests in February 2008. It was then carefully packed and shipped to the Joint Astronomy Centre in Hawaii, arriving there in March 2008.

SCUBA image of the galactic centre showing hitherto unseen sites of high mass star formation. Originally published by Pierce-Price et al. in 2000



The SCUBA-2 installation team at the JCMT, Hawaii

SCUBA-2 has just been successfully installed on the JCMT, which first had to be modified to take the larger instrument. Observing programmes are due to start in the autumn.

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Encouraging collaborations

Through encouraging partnerships and exploitation of its world class capabilities, the UK can overcome some of the most pressing problems that are threatening society and the economy.

The Science and Innovation Campuses at Daresbury and Harwell (see page 14) will act as important national focal points for science-based collaboration and knowledge exchange with academic and industrial researchers. New Science and Technology Gateway Centres are under development to further enhance such partnerships and a complementary suite of 'Futures Programmes' are also planned to gain better understanding of and help solve the impending challenges.

Encouraging synergy today to solve the problems of tomorrow

Science and Technology Gateway Centres

Five new Gateway Centres are proposed by the STFC to deliver a new level of engagement with academic and industrial partners and to build a strong and interactive community of world-leading scientists, technologists and innovators. The centres will enable access to the Council's cutting-edge facilities and core scientific and technological strengths in computing, space science, detector technology, imaging and materials science.

Detector Systems Centre

This new centre will encourage academic and industrial collaboration utilising STFC's world class detector capabilities and knowledge base. It will support fabrication, prototyping and characterisation of sensors, both for research applications and industrially applicable markets (such as security and biomedical imaging), and will develop and commercialise sensors and integrated detector solutions.

Hartree Centre

Focusing on multi-disciplinary, multi-scale, efficient and effective simulation, this centre will bring together academic, government and industry communities. Located on the Daresbury Campus, it will provide a step-change in modelling capabilities for energy research, life sciences, the environment, materials, and fundamental physics.

Imaging Solutions Centre

Transforming access to the STFC's world class facilities, this centre will provide a gateway and consulting services to deliver 'one-stop' solutions for both industrial and academic research. The centre will exploit access to the council's facilities and expertise in computer simulation, detectors, data acquisition and analysis.

Joint Institute for Materials Design

This novel centre, linking the ISIS neutron source, the Central Laser Facility and the Diamond Light Source, will serve as a focus of knowledge exchange between industry, academia and the large scientific facilities of the Harwell Campus. The institute will offer expertise and leadership in materials discovery, characterisation and imaging in areas such as energy applications (storage, fuel cells, batteries, catalysis, solar energy, and lightweight structures) and electronics.

Space Centre

Located on the Harwell Campus, this centre will provide complementary capability in three areas: the co-ordination of activities supporting global climate change research and environmental impacts; identification of opportunities for new integrated applications of space technology; and a facility for exploration, novel power and robotic technologies.

Clearly focused on the STFC's underlying technological competencies, the Technology Gateway Centres will maximise synergy between applications.

The Futures Programmes

The STFC proposed 'Futures Programmes' will focus on exploitation of its capabilities to the benefit of six key areas of societal and economic importance, i.e. energy, environmental change, security, biomedical applications, the digital economy, and nanoscience and nanotechnology. Each programme also directly relates to the multidisciplinary cross-council programmes agreed by Research Councils UK.

Energy

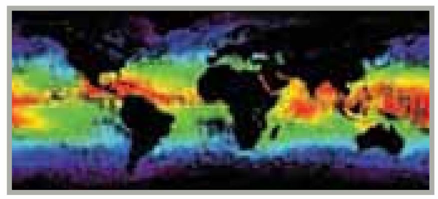
Contributions will include the development of new materials for fuel cells, photovoltaic devices, and hydrogen storage as well as the development of renewable energy sources and clean burning of coal. The STFC will work with both industry and academic researchers and make use of the Joint Institute for Materials Design and Imaging Solutions Centre as gateways to the STFC's facilities and as a focus for interdisciplinary collaboration.

Environmental Change

This programme will focus on providing support in the areas of molecular studies of greenhouse gases, satellite technologies for earth observation, and high performance computing for modelling environmental change, exploiting the proposed Hartree Centre. The new space centre at Harwell will also play an important role; climate change is an explicit part of its mission.

Security

The exploitation of STFC technology in areas such as: the use of lasers to detect explosives, nuclear materials and counterfeit drugs (with STFC's new spin-out company, LiteThru Ltd); development of more effective X-ray detector systems for airport security (with a major manufacturer, CXR); and application of novel terahertz imaging technology to the security market (with ThruVision, another STFC spin-out company).



Biomedical Applications

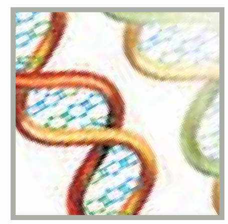
Building on its very successful technology partnership programme which applies capabilities in detectors, nanoscience and technology to support biomedical applications, this programme will develop techniques within the STFC's facilities to explain drug actions in diseases such as cancer, osteoporosis and neurological disorders and to tackle crucial biological problems like aberrant protein folding in Alzheimer's, motor neuron and prion disease.

Digital Economy

The STFC will explore opportunities to apply expertise in data-intensive computing, where it might host computational facilities for university or research council partners. The deployment of grid computing technologies to enable effective large scale data processing, data mining, information curation and preservation using large numbers of computers collaboratively will be investigated.

Nanoscience and Nanotechnology

Existing networks in nanoscience and technology will be developed to support this programme including use of the Joint Institute for Materials Design, Hartree Centre and Imaging Solutions Centre as gateways for collaboration with academic and industry researchers.



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People are the cornerstone of the STFC and the UK economy

The economic impact of science, technology and innovation is important to the future prosperity and wellbeing of the country, however, benefits can only be achieved with motivated, highly skilled and professional staff. Without this essential resource, fulfilment of the Council's mission would not be possible. A highly skilled workforce is an organisation's most important asset and is essential for the Council in increasing knowledge exchange and economic impact.

The STFC employs a workforce of some 2,000 people and is committed to ensuring the safety, wellbeing and development for all, helping staff realise their own capability for learning and raise their quality of life.

Staying safe, healthy and green

The Council's health, safety and environment management systems assure the health and safety of staff and others and work towards a 'greener' working life.

Health and safety in the workplace is of paramount importance, not only because health and safety at work legislation places obligations on employers and employees, but because identifying and dealing with risks before they cause an adverse impact on any individual in the workplace optimises productivity and maximises employee opportunities.

The principal STFC laboratories, Daresbury and Rutherford Appleton, both received Royal Society for the Prevention of Accidents (RoSPA) Awards, for their health and safety management practices and overall health and safety performance in 2008. For the first time the Daresbury Laboratory received a RoSPA President's Award for ten consecutive years of Gold Awards, building upon the President's Award received by the Rutherford Appleton Laboratory in 2007.

Proactive 'green' campaigns at all STFC sites are increasing awareness of environmental issues. Specific items for which recycling schemes exist include printer cartridges, fluorescent tubes, computer monitors, drink cans, scrap metals, paper and cardboard. In addition, the re-distribution and re-use of furniture is both reducing costs and environmental impact, and ceramic mugs rather than disposable cups have been re-introduced in some site canteens.

At the Rutherford Appleton Laboratory alone, during 2007-2008 the recycling of materials reduced waste by:

- 31 tonnes of waste paper;
- 32 tonnes of cardboard;
- 420 computer monitors;
- 700 printer cartridges; and
- 923.5 tonnes of ferrous metals and over 20 tonnes of non ferrous metal

In collaboration with other research councils on the Polaris House site, 70% of all STFC Head Office's waste is being recycled and a purchasing 'Green Product List' has been established.

Investing in

Ensuring the future

To strengthen the future of the UK economy, the STFC is helping to develop a sustainable supply of skilled people to support future UK science and technology research and innovation. The Council runs highly respected Engineering Apprentice and Graduate Training Schemes in addition to an extensive programme of learning and development opportunities for staff at all levels. Learning and development is fundamental to people achieving their ambitions, as individuals, for families, for the community and within the workplace; skills serve a dual purpose, enabling people to realise both social and economic success.

To help underpin the government's goal of nurturing a supply of skilled people, and to ensure the future of UK research, the STFC actively promotes science, technology and engineering as a career choice to students of all ages. Through interaction with schools on a national and regional level, the Council engages with the science curriculum, providing inspirational educational materials, award winning on-line resources and enthusiastic role models to encourage the next generation of scientists and engineers.

In addition, the STFC nurtures potential young employees through its highly respected research studentship and fellowship schemes (see page 64). The Council is also proactively attracting young people into scientific and technological careers through its challenging science programmes, and by equipping them with the high level of skills research demands from advanced technology and computing to international project management. Such skills, highly desirable in many sectors, are essential for sustaining the health of the UK's academic community.

The STFC aims to develop strategic partnerships both regionally and nationally to establish a skills development and capacity building programme which will become a key component of the campus initiatives (page 14). Plans include the establishment of Science and Innovation Resource Centres within the Daresbury and Harwell Science and Innovation Campuses to provide the capacity and infrastructure to support the delivery of training, knowledge exchange, entrepreneurship and innovation to its customers and collaborators in business and academia.

The knowledge and expertise gained through investment in people and innovation allows the UK to stay at the forefront of science and technology, build a strong economy and improve quality of life for its most important resource – people.

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Trained Scientists and Engineers

One of STFC's highest priorities is the training and supply of a pool of highly trained scientists and engineers to meet the needs of academia, commerce, industry and other employment sectors

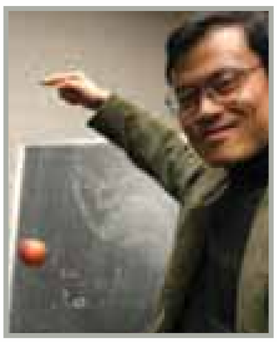
The Council has a primary role alongside other research councils as a key financer of postgraduate and postdoctoral research training, whilst the Daresbury and Harwell Science and Innovation Campuses provide a unique environment for collaborative research, training and innovation through their strong relationships with government departments, funding agencies, professional bodies, schools, colleges, universities and industry.

The Council's postgraduate research studentships programme currently supports just under 700 PhD students. The majority of PhD studentships are allocated to university departments through a biennial quota allocations exercise. Demand for research studentships remains high; at the 2007 quota research studentships exercise 74 departments submitted applications seeking over 1,280 studentships against the 520 awards available across the two academic years (2008 and 2009). Departmental applications for quota research studentships are assessed and graded, by the Education, Training and Careers Committee, against a range of criteria focussing on the research activity and training environment offered by departments. Studentships' funding for awards from the 2007 quota exercise are announced as doctoral training grants, allowing departments maximum flexibility over use of funds, i.e. to support studentships of longer or shorter duration, to vary start dates, to fund studentships in partnership with other organisations and to recruit students to priority research areas. Doctoral training grants were piloted successfully for STFC funding to nuclear physics groups for the 2007 academic year.

Studentship support to university departments is also provided through project studentships on research grants, through specialist training initiatives such as the Next Generation Facility Users Studentship Programme, funded in partnership with the Engineering and Physical Sciences Research Council (EPSRC). Such support enables training for up to 50 students on facilities such as Diamond and ISIS Second Target Station and through Collaborative Awards in Science and Engineering (Case). Case studentships offer students training and research experience outside a purely academic environment. Under the extended scheme, Case Plus, students can take up employment with the non-university sponsor for the fourth year of study.

The Council's postdoctoral and advanced fellowship schemes attract high calibre applicants worldwide. In 2007-2008 over 360 applications were received for the 24 available fellowships. Postdoctoral fellowships provide three years of funding to 'up and coming' researchers of high potential, enabling them to develop their research

Courtesy Diamond



ideas further. Advanced fellowships provide five years of funding to leading researchers in their field to enable them to focus on development of their research free from administrative and teaching demands. The recipient of the Halliday Fellowship in 2007-2008 was Dr Frederic Pont, an astronomer who joined the Exeter University Physics Department from the University of Geneva. This award provides the top advanced Fellow each year with an additional £50,000 for use on resources for their fellowship project.

An Education and Public Outreach Committee, chaired by Professor Mike Edmunds, has been established within the advisory structure of STFC. The Committee examines the societal impact of the Council's programme, with particular focus on education and training, science in society and public relations programmes.

At cross councils level, STFC works with other research councils and Research Councils UK (RCUK) Careers and Diversity Unit in promoting and supporting researcher mobility, career development and transferable skills training for students and postdoctoral researchers. Women in Science, Engineering and Technology (WiSET) issues are addressed through the Council's WiSET Focus Group and WiSET Networking Group. The Focus Group, which consists of female university academics and researchers, advises on and monitors STFC funding schemes to ensure they are family friendly. During 2007-2008, the Focus Group has contributed to a cross research councils' WiSET review of funding opportunities for 'Returners to SET' and to events for women such as the SET Routes conference (funded under the EU Framework 6 program) which was held in Heidelberg in May 2007. The WiSET Networking Group provides a forum for female scientists, engineers and technicians employed by STFC to discuss issues of common interest related to their careers and working lives. Links and cross working between the Focus and Networking Groups have been strengthened throughout 2007-2008, highlighted by a joint visit to the STFC Rutherford Appleton Laboratory and a tour of the Diamond Light Source in December 2007.

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Web:	www.scitech.ac.uk/Grants/Studs/Contents.aspx www.scitech.ac.uk/Grants/Fells/Contents.aspx www.scitech.ac.uk/About/WinS/Contents.aspx

PUBLIC INTEREST

One hundred media releases were issued by the Council during 2007-2008, covering science and technology discoveries and developments and technological applications, and several media briefings were held. Highlights included astronomy and space results from the STEREO and Hinode space missions, discoveries of new ‘exoplanets’, and many advances in knowledge about materials and particles made through STFC facilities and support, together with applications of new knowledge in terms of knowledge exchange and development of spin-off companies.

Three research groups won places at the prestigious Royal Society Summer Exhibition in 2007 – three covering astronomy and space topics, and ‘Matter Matters!’ which focused on the amazing world of materials science studied at ISIS.

ISIS scientist Professor Bill David explained the science of hydrogen storage to HRH Prince Charles (who test drove some of the cars) at the STFC sponsored 2007 Brighton to London Eco-car Rally

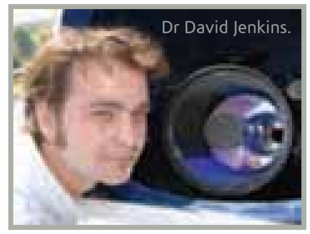
Courtesy Pete Skinner on behalf of Revolve/TfL

In July 2007, the STFC sponsored the 2007 Brighton to London Eco-car Rally. Leading car manufacturers showcased vehicles that use new fuels and technologies, whilst scientists from the Rutherford Appleton Laboratory were at hand to explain the science behind the technology and how they are using the ISIS pulsed neutron source to investigate the hydrogen storage properties of new materials.

The STFC sponsored Large Hadron Collider (LHC) public engagement programme has also been extremely successful, a major highlight being the ‘Big Bang’ exhibition which was launched at the Science Museum in London in April 2007, followed by a touring exhibition starting at Newcastle in mid-December and Glasgow from March 2008. A major educational resource, ‘particledetectives.net’ was launched in November and later collected 2nd prize in the e-learning category at the International Visual Communications Association annual awards. Short films about the LHC were also produced, in collaboration with Teachers’ TV, and edited extracts were placed on YouTube.

SUPPORTING THE RESEARCH COMMUNITY

STFC hosted a community meeting in November 2007 to discuss public engagement.



Dr David Jenkins.

Attracting over 150 researchers and communicators, the meeting proved a great success. In 2007-2008, three new Science in Society Fellows were appointed: Dr Francisco Diego (University College London), Dr David Jenkins (University of York), and Dr Chris Lintott (University of Oxford). The STFC also enabled over 40 researchers to perfect their media and public communications skills via excellent in-house and university based courses.

Dr Andrew Smith leading a tour of the SRS Facility

In February 2008, STFC Daresbury Laboratory hosted a workshop on heritage science in support of the UK national Science and Heritage programme. The workshop successfully promoted and educated attendees as to the STFC’s large scale facilities

Public interest in and engagement with science, engineering and technology is of vital national and international importance. It is important both to demystify the subject, communicate its social and economic impact and to inspire the next generation of researchers. The STFC stimulates and responds to public interest in science and technology developments, engages young people, supports researchers’ public engagement work and capitalises on curiosity about its excellent science and research establishments.

Engaging with

contribution to archaeology, conservation and heritage science.

ENGAGING TEACHERS AND THE YOUNG

During 2007-2008, the STFC supported wide ranging public engagement projects through 25 Small Awards worth a total of £180,000, three Large Awards totalling £230,000 and five Science Centre 11-16 Awards worth £90,000. The Council also awarded 119 small grants to schools for the enrichment of physics teaching, in collaboration with the Institute of Physics.

The STFC had a good presence at educational events during the year, including the Association for Science Education exhibition in Liverpool in January and the Education Show in March. As a member of the British National Space Centre (BNSC) partnership, the Council supported the development of a UK Space Education Office, developed a project for 'beacon' schools using space, and represented the UK to the European Space Agency's Education Committee.

In a 'pulse' of support, the STFC also helped 115 teachers make inspiring visits to CERN, including 21 who attended a 3-day course in February 2008. Earlier in the year, a group of UK arts students also visited CERN to gain inspiration for fashion design from the world's largest science experiment.

EXCELLENT CENTRES

The Daresbury and Rutherford Appleton Laboratories delivered dynamic programmes of public engagement during 2007-2008, including: media releases, visits and filming; thirty public lectures; eighty-three schools visits; numerous teacher visits; 10 teacher CPD courses and a remarkable 110 work experience placements. In addition, over 90 enthusiastic Science and Engineering Ambassadors were also kept busy hosting courses, inspiring and educating visitors and school children, attending and presenting lectures at conferences and careers fairs and manning exhibition stands.

The UK Astronomy Technology Centre in Edinburgh also hosted immensely popular school visits, open days, public observing sessions, public lectures, outreach to schools, and events in Edinburgh city. Staff also led on the multi-agency, nationwide project 'Dark Sky Scotland' which successfully inspired and fascinated the public with the skies through astronomy research, especially in rural areas.

UK students, teachers and artists on an inspirational visit to CERN

Courtesy Dr Peter Edwards

WORKING TOGETHER

The STFC has also worked closely with joint Research Councils UK programme, which this year mainly focused on 'Beacons for Public Engagement' – a £9 million project in partnership with the Funding Councils to encourage outreach by the University sector. Other highlights included the 2008 National Survey of Public Attitudes to Science (published in February), Research Updates for teachers at Science Learning Centres, and support for the national CREST and Nuffield Science Bursary schemes.

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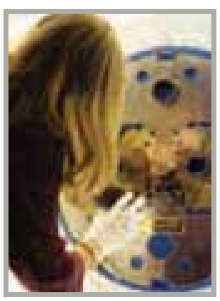
Young scientists learn how to make rockets at Chilbolton Observatory's Open Day

Science in Society Events

GRIDS FOR KIDS

The complexities of Grid computing may seem like a barrier to explaining it to 10 and 11 year olds. The UK's first 'Grids for Kids' day proved that idea wrong. The event, held at the STFC Rutherford Appleton Laboratory in November 2007, hosted 36 children from the local Stephen Freeman Primary School.

The National Grid Service, Particle Physics Grid, Enabling Grids for e-Science, the STFC and Integrated Site Security for Grids sponsored the event.



Preparing the 'Big Bang'

BIG BANG EXHIBITION

The Science Museum London unveiled the 'Big Bang' on 3 April 2007, an exhibition celebrating the Large Hadron Collider (LHC), a particle accelerator under construction at the European Particle Physics Laboratory, CERN. The exhibition, supported by the STFC, showcases all aspects of the LHC, the world's biggest experiment.

ROYAL SOCIETY EXHIBITION 2007

In 2007 the Royal Society received over 110 proposals from around the UK, of which just 23 were selected. 'Matter Matters', 'Living with a Star: Surviving Near Our Explosive Sun' presented by a collaborative group studying solar eruptions as part of the International Heliophysical Year, and 'Protecting the Planets', were three of the successful bids. All three groups included researchers from the Rutherford Appleton Laboratory and were supported by the STFC.

2007 EDINBURGH DOORS OPEN DAY

As part of the 2007 Edinburgh Doors Open Day the Royal Observatory of Edinburgh (ROE) opened its doors to the public. Visitors attended talks, demonstrations and exhibits, and learnt about the mammoth mega-projects undertaken at the UK Astronomy Technology Centre and the ROE.

PAIRING UP WITH MPS

Scientists at STFC's Laboratories have been teaming up with MPs to gain a deeper understanding into each others' professions as part of a unique Royal Society 'pairing' scheme, designed to forge constructive working relationships between parliamentarians and scientists in the UK.

MP Anne Snelgrove (left) with RAL's Dr Kate Lancaster.

PUBLIC LECTURES

An inspirational programme of popular science talks has continued at the Daresbury Laboratory, Rutherford Appleton Laboratory and the UK Astronomy Technology Centre (UK ATC). Topics covered included the physics of sound, invisibility cloaks, the 'Horrible Science Show' (pictured above), stress, the tools and techniques used to build Stonehenge and a fascinating lecture on the world's largest physics experiment (CERN's Large Hadron Collider). The UK ATC continued to hold its immensely popular observing evenings where vistors could journey through our Solar System, hold a rock from space and, if clear weather, observe the heavens using STFC's telescopes.

STAR GAZING INSPIRES COMMUNITIES TO SWITCH OFF LIGHTS

Two Highland communities were so inspired by STFC sponsored star-gazing sessions that they decided to take part in the global Earth Hour event. The event saw households and businesses switch off their lights at 8pm for one hour on Saturday 29 March 2008. Community leaders in Knoydart and Laggan encouraged local people to take part and were proud to be adding their voice to those of cities such as Chicago, Dublin and Toronto. The UK Astronomy Technology Centre's Dan Hillier, the Dark Sky Scotland Project Leader was thrilled that Dark Sky Scotland inspired people to get involved. During 2009, the International Year of Astronomy, Dan hopes to raise awareness of Earth Hour in the UK and have communities large and small across the country taking part.

Courtesy Duncan Stewart Sm

The Dark Sky Scotland project inspired people accross the nation to gaze at the stars

School Science Prizes

The STFC has continued to sponsor an awards evening at the Daresbury and Rutherford Appleton Laboratories where local schools can nominate a Year 9 student who has either performed extremely well in science subjects or who has made significant progress

PARTICLE PHYSICS MASTERCLASSES

Over 600 A level physics students attended particle physics masterclasses at the Daresbury and Rutherford Appleton Laboratories in 2008. Students attended a mixture of educational talks, inspiring tours and took part in practical work to gain a deeper understanding of this notoriously difficult part of the school curriculum. The masterclasses continue to be very popular with both teachers and students alike and are over subscribed every year.

PARTICLE DETECTIVES WEBSITE

The Particle Detectives website, packed with videos, lesson plans and a LHC simulation was launched in 2008. Produced for the STFC by Edcoms, the website is proving a great success. See www.particledetectives.net for more details.

NEXT GENERATION ENGINEERING

The STFC supports the Engineering Development Trust's Engineering Education Scheme (EES). The scheme links a professional engineer with a team of high ability Year 12 students (and their teacher) for 5 to 6 months to solve an engineering problem for a local company. This invaluable experience enables them to make more informed career decisions through a better understanding of engineering as a profession. Nationally, around 2,000 students take part in the scheme each year. For the engineer, the Academy regards the scheme as an important step in their continuous professional development.

A 'QUANTUM OF SOLACE' IN CHILE

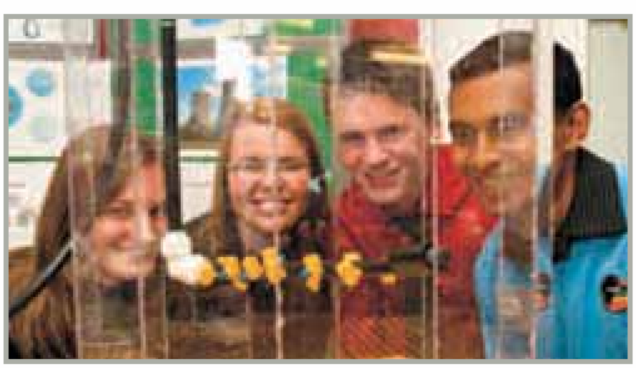
Cerro Paranal, the 2,600 m high mountain in the Chilean Atacama Desert, home of the world's most advanced optical observatory, was the chosen setting for filming scenes for the next James Bond movie, 'Quantum of Solace'. Looking akin to Mars, with its red sand and lack of vegetation, the Atacama Desert is thought to be the driest place on Earth. The European Southern Observatory's (ESO) Very Large Telescope (VLT), an array of four giant 8.2 m individual telescopes, is based at Cerro Paranal as its high-altitude and extreme dryness provide excellent conditions for astronomical observations. Through membership of ESO, the STFC ensures UK access to these world class facilities.

Courtesy Sony

Daniel Craig (007) with Producer Marc Forster in Paranal

Courtesy ESO

La Residencia, Paranal Observatory, used as the setting for the villain's hiding place in the 22nd James Bond movie



Participants of the Engineering Education Scheme

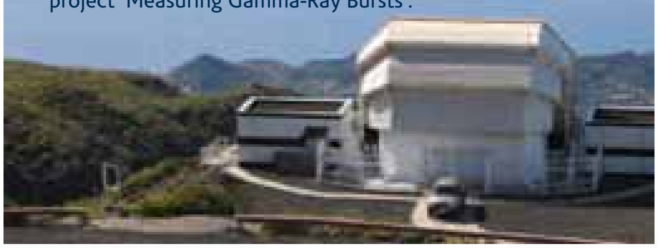
Awards and events

2007 Walter Haelg prize

Professor Jeff Penfold from the Rutherford Appleton Laboratory has been awarded the 2007 Walter Haelg prize, awarded biennally to a European scientist for outstanding work in neutron scattering.

2007 TIMES HIGHER AWARD

A team of astrophysicists from Liverpool John Moores University have scooped the prestigious 2007 Times Higher Award for Research Project of the Year for the STFC funded project 'Measuring Gamma-Ray Bursts'.



Courtesy Observatorio del Roque de los Muchachos, La Palma

2007 PORTLET CHALLENGE CONTEST

Xiaobo Yang of the e-Science Frameworks Group was awarded first prize in the 2007 Portlet Challenge Contest. The Portlet Challenge Contest, sponsored by Sun Microystems, is designed to attract developer contributions to the Portlet-Repository, an open-source Java.net project.

6th most important scientific discovery

The discovery of three transiting planets by the UK's leading extra-solar planet detection programme has been named 'the 6th most important scientific discovery of 2007' in Time Magazine's Top Ten List. Astronomers from the Wide Area Search for Planets (WASP) announced the discovery on 31 October 2007. The extra-solar planets were seen to pass in front of, or transit, their host star.

Studying such planets outside of our Solar System allows scientists to investigate how planetary systems form. WASP is the first team to detect planets in both the Northern and Southern Hemisphere using this technique.

Courtesy David A Hardy

2007 VizNET Showcase Award

The 2007 VizNET Showcase first prize has been awarded to the e-Science Centre's **Dr Lakshmi Sastry** for her distributed, high resolution visualisation of the rabbit heart using commodity cluster and open source software stack. The visualisation was developed as part of the Integrative Biology project.

Dr Laksmi Sastry (centre) and colleagues

2007 DAIWA ADRIAN PRIZE

An Anglo-Japanese collaboration has been awarded the 2007 Daiwa Adrian Prize for research entitled 'High energy density science: new frontiers in plasma physics'. The team – led by **Professor Peter Norreys** from the STFC Central Laser Facility (left) and Professor Ryosuke Kodama from Osaka University, Japan – included researchers from Imperial College London, Queen's University Belfast and the universities of Oxford and York.

ROYAL SOCIETY OF EDINBURGH FELLOWS 2008

Following in the footsteps of distinguished predecessors such as Sir Walter Scott, Charles Darwin and Einstein, over sixty experts have been elected Fellows of The Royal Society of Edinburgh (RSE), including three researchers whose work is funded by the STFC: **Professor Sheila Rowan**, University of Glasgow – elusive gravitational waves (one of the last untested predictions of Einstein's work); **Professor Ian Bonnell**, University of St Andrews – star formation and the dynamics of young stellar systems, and; **Professor Philip Woods**, University of Edinburgh – nuclear astrophysics (the process by which the chemical elements are created in stars) and exotic nuclei. Fellows are elected in recognition of outstanding achievement in their fields and contribution to public service.

2008 Group Achievement Award

The 2dF Galaxy Redshift Survey Team, including scientists at the Institute for Astronomy at the Royal Observatory Edinburgh and at many other British universities as well as institutions in Australia and the USA, has received the prestigious 2008 Group Achievement Award from the Royal Astronomical Society.

Courtesy NASA/ESA

Chilbolton Open day

The Chilbolton Observatory was officially opened on 14 April 1967, 40 years later the 14 April fell on a Saturday – a perfect opportunity to celebrate and open its doors to the public.

Alex James and Professor Richard Holdaway at the 40th celebrations

Following celebrations and tours for VIPs and the press, thousands of curious visitors flocked to Chilbolton to find out more about the Chilbolton Facility for Atmospheric and Radio Research. They discovered at first hand what experimental work is carried out, viewed the instruments close up, and met the scientists and engineers who work on the projects. In its 40th year, the Chilbolton Observatory continues to make a major contribution to the delivery of world class science.

SCARF-LEXICON

Professor Peter Norreys (front left) and **Dr Neil Geddes** (front right) launched the SCARF-LEXICON cluster in June 2007. The Scientific Computing Application Resources for Facilities (SCARF), Laser theory and Experimental Interpretation COmpute Nodes (LEXICON) cluster has been installed in the Atlas Centre and integrated into the SCARF computing resource available to STFC researchers. SCARF-LEXICON will be used for numerical simulations of plasmas produced in the Vulcan and Astra lasers at the Central Laser Facility.

Professor John Wood – a fond farewell

Professor John Wood left the STFC in July 2007 to become the new Principal of Engineering at Imperial College London, taking over the reigns from Dame Julia Higgins. Professor Wood had served as the Chief Executive of the former CCLRC for six years prior to the formation of the STFC. "I look back on the past six years as the most exciting time in my career", said Professor Wood, "the mixture of cutting edge discovery and dedicated people is intoxicating. Long may it continue!"

Professor John Wood receiving a painting of the Rutherford Appleton Laboratory from Dr Andrew Taylor on the occasion of his departure from STFC

30 YEARS OF WORLD-LEADING LASER SCIENCE

The past, present and future of the Central Laser Facility (CLF) came together on 28 June 2007 when **Professor Mike Dunne** hosted an event to celebrate the 30th anniversary of the CLF at the Rutherford Appleton Laboratory. In a light-hearted presentation, Professor Dunne charted the history of the facility and its key role in the development of laser science from single beam interaction studies to particle acceleration and the possibilities of laser fusion. Celebrations concluded with a reception during which staff and visitors swapped memories of the first 30 years of the Central Laser Facility.

Diamond's Royal opening

Her Majesty The Queen, accompanied by His Royal Highness The Duke of Edinburgh, officially opened Diamond Light Source, the UK's new national synchrotron facility, on Friday 19 October 2007. Diamond is the largest science facility to be built in the UK for 40 years and is set to play a major role in facilitating ground breaking science that is carried out in this country over the coming decades.

Courtesy Diamond

RAL's 50th anniversary

On 2 November 2007, friends, colleagues and distinguished guests met to celebrate the 50th anniversary of the Rutherford Appleton Laboratory (RAL). The Head of the Laboratory, Dr Andrew Taylor, chaired an afternoon programme of short talks which addressed the past achievements and future prospects for the Laboratory's work in particle physics, space, technology, lasers and materials science. The talks were followed by an evening reception and dinner for over 250 VIP guests.

DUKE OF EDINBURGH RECEIVES GOLD AWARD

On Friday 19 October 2007 **HRH The Prince Philip**, Duke of Edinburgh received a 'gold award' during a private visit to RAL. In 1957 the International Geophysical Year (IGY) was a display of unprecedented international cooperation with more than 60,000 scientists and engineers from 67 nations all studying the Earth and geospace. The IGY also heralded the start of space exploration, with the launch of Sputnik 1 in October 1957. Later that year, a live BBC broadcast by the Duke of Edinburgh explained what scientific activities would be taking place in the future. HRH The Prince Philip explored the STFC Space Science and Technology Department to discover just how far space science has come since his broadcast fifty years ago. In recognition of the Duke's support of scientific research, and his 1957 broadcast, he was presented with an IGY Gold Award as part of the International Heliophysical Year (IHY) celebrations. The IHY began in February 2007 and runs to February 2009.

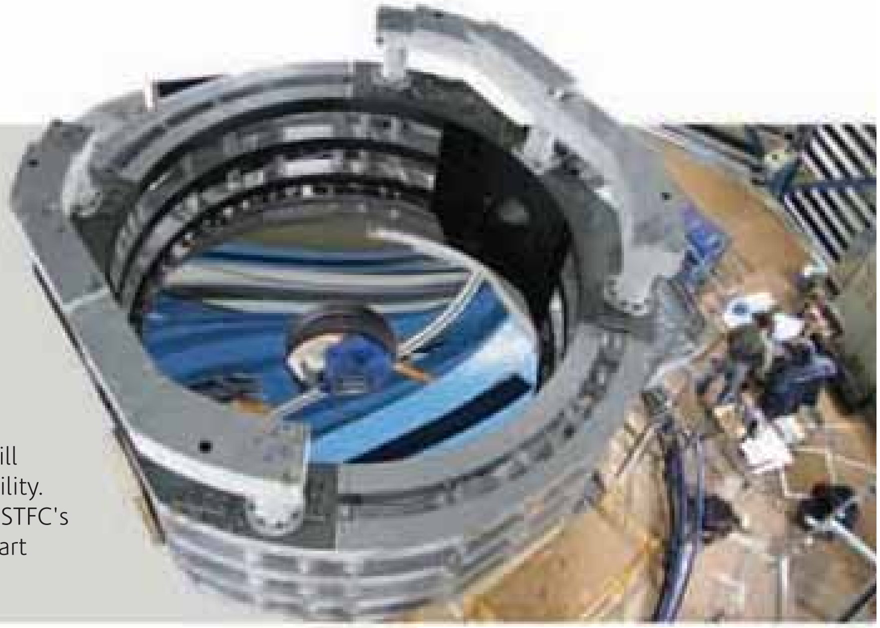
Astra Gemini

Ian Pearson MP, Minister of State for Science and Innovation, officially opened the STFC Astra Gemini laser at the Rutherford Appleton Laboratory on 28 November 2007. Astra Gemini can enable scientists to carry out a broad range of experiments including simulating the conditions inside the Sun and recreating the birth of stars. The new facility opened to the international user community in January 2008.

HRH The Prince Philip, Dr Danielle Bewsher and Professor Richard Holdaway

Survey telescope nears completion

A 4.1 metre diameter mirror, a vital part of the world's newest and fastest survey telescope, VISTA (Visible and Infrared Survey Telescope for Astronomy), was delivered to its mountain top home at Cerro Paranal Observatory, Chile in March 2008. VISTA, a survey telescope being constructed for ESO (the Organisation for Astronomical Research in the Southern Hemisphere), will form part of the Very Large Telescope facility. VISTA, a £36 million project managed by STFC's UK Astronomy Technology Centre, will start scientific operations early in 2009.



Courtesy VISTA, Andy Born

UN Climate Change Conference

STFC scientist Charlotte Pascoe was invited to give a presentation on the Intergovernmental Panel on Climate Change (IPCC) Data Distribution Centre at the UN Climate Change Conference in Bali in December 2007. Set up by the IPCC Task Group on Data and Scenario Support for Impact and Climate Analysis, the Data Distribution Centre facilitates the timely distribution of a consistent set of up-to-date scenarios of changes in climate and related environmental and socio-economic factors for use in climate impacts assessments. The DDC is jointly managed by the British Atmospheric Data Centre (BADC) at RAL, the CSU World Data Center Climate in Germany, and the Center for International Earth Science Information Network in the USA.

EDINBURGH ASTRONOMERS DELIVER 'ORIGINS' CAMERA

On 21 February 2008 the STFC's UK Astronomy Technology Centre (UK ATC) at the Royal Observatory Edinburgh shipped its biggest and most complex ever instrument. The giant camera known as SCUBA-2 set off on its long journey to the James Clerk Maxwell Telescope (JCMT) on top of a 14,000 foot mountain in Hawaii where it is expected to make major discoveries related to the origins of galaxies, stars and planets. The camera is now being installed on the JCMT and is due to see first light in late summer 2008.

Accounts

Statutory basis of the Council

The Science and Technology Facilities Council (STFC) was established on 1 April 2007 as an independent Research Council under the Science and Technology Act 1965, upon the merger of the Council for the Central Laboratory of the Research Councils (CCLRC) and the Particle Physics and Astronomy Research Council (PPARC). STFC's Royal Charter was granted by Her Majesty the Queen on 7 February 2007.

The Council's remit covers all the programmes, activities and facilities previously operated by CCLRC and PPARC, plus responsibility for research in nuclear physics which was transferred from the Engineering and Physical Sciences Research Council (EPSRC) on 1 April 2007. STFC's activities during 2007-2008 have been in accordance with the objects set out in its Charter which is available on the Council's website (see www.scitech.ac.uk/About/Strat/Council/essinfo/charter.aspx).

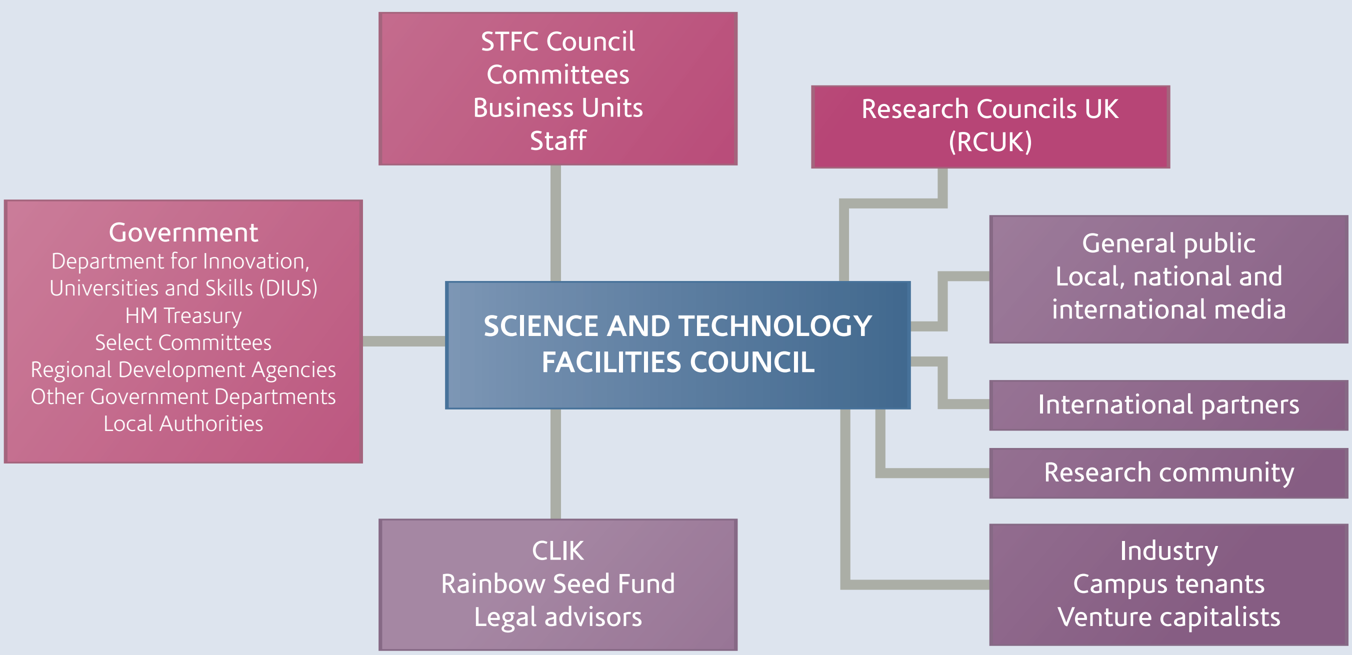
The STFC Group

Throughout 2007-2008 the Council operated as a corporate Group (STFC Group). The STFC is one of Europe's largest multidisciplinary research organisations supporting scientists and engineers world-wide. The Council (STFC) operates world class, large scale research facilities and provides strategic advice to the UK government on their development. It also manages the UK interests in major international collaborations such as CERN / ESA and research projects in support of a broad cross-section of the UK research community. The STFC also directs, coordinates and funds research, education and training.

As well as operating as a single corporate entity, the Council has operated its own wholly-owned trading subsidiary, Central Laboratory Innovation and Knowledge Transfer Limited (CLIK). The STFC also continued to be the major shareholder in Diamond Light Source Limited (DLSL), a joint venture established with the Wellcome Trust Limited for the construction and operation of the Diamond facility, a third generation, medium energy, synchrotron radiation source.

Key stakeholders

STFC's key stakeholders are illustrated in the following diagram:



Management commentary

FINANCIAL PERFORMANCE – REVIEW OF THE YEAR

From 1 April 2007, the Science and Technology Facilities Council (STFC) commenced operations and assumed ownership of the consolidated assets and liabilities of the Council for the Central Laboratory of the Research Councils (CCLRC), the Particle Physics and Astronomy Research Council (PPARC) and the Nuclear Physics grant awarding responsibilities of the Engineering and Physical Sciences Research Council (EPSRC).

Creation of the STFC Finance Team

Creation of the new Council required that the financial processes, systems and procedures of the predecessor Councils be integrated and operate consistently from 1 April 2007. Prior to the merger, it was decided to continue to use the ex-CCLRC and ex-PPARC extant finance systems until migration of the Council's administration and finance activities to the Research Councils' Shared Services Centre single unified system in 2008-2009.

Continued operation of the two systems brought with it the need to build an overarching consolidation system to provide STFC-wide financial information, and the full integration of processes, procedures and staffing. Encouragingly, the systems have operated successfully to the extent that full information has been provided to all budget holders throughout the financial year, and the final accounts prepared to time and quality. This is to the great credit of the Finance team.

Group financial performance

As a Non Departmental Public Body (NDPB) the Council is required to remain within its specific budgeted limits agreed with the Department for Innovation, Universities and Skills (DIUS), under the governance of Resource Accounting and Budgeting (RAB); the regime by which HM Treasury, on behalf of Central Government, ensures Public Sector spending is satisfactorily controlled. In compliance with this regime, in April 2007, and again in September 2007, STFC was required to advise DIUS of its total forecast net expenditure for the year end, based on the requirement from HM Treasury to adhere as closely as possible to the forecast.

Adherence to this forecast required detailed and robust financial management, both in forecasting the annual outcome and ensuring rapid responses to the changing circumstances of STFC's substantial programme. The original forecast was based on STFC's plans which were based on the Delivery Plans of the predecessor Councils.

Funding for the STFC Group was obtained by aggregating the Government's planned 2007-2008 allocations for CCLRC and PPARC together with that for the EPSRC's Nuclear Physics grant awards. Total funding was sub-allocated based on the expenditure plans of the predecessor Councils. In parallel, a review of activity was commenced to determine programme priorities for the new organisation. Prior to the completion of that review, the outcome of the Government's Comprehensive Spending Review (CSR) 2007 was announced. This provided a 13.6% increase in allocation across the CSR years (2008-2009 to 2010-2011).

STFC 2007-2008 final accounts

The accounts for the STFC Group are presented as a Consolidated Statement of Net Expenditure, Consolidated Balance Sheet, STFC Balance Sheet, Consolidated Cash Flow Statement and Consolidated Statement of Recognised Gains and Losses. They are prepared in accordance with an accounts direction issued by DIUS.

Summary STFC financial position

As a consequence of the expected pressure on 2008-2009 and later years' budgets the Council pro-actively took steps to reduce spend in 2007-2008. This was done not only to reduce liabilities but also to provide a carry over of funding into 2008-2009. The Council set itself a target of achieving an underspend of £18.832 million and achieved the following:

	Resource £'000	**Capital £'000**	**Total £'000**
Allocation	513,532	154,274	667,806
Outturn*	479,390	165,431	644,821
In year underspend/(overspend)	34,142	(11,157)	22,985

*Reconciled as follows:

	Note	£'000
Net expenditure for the year before reversal of cost capital	Consolidated SNE	538,971
Funding from international partners	Note 16	(1,625)
Grant from Joint Infrastucture Fund	Note 16	(138)
Subsidiary transactions (CLIK)		(251)
Fixed asset additions	Note 10	81,456
Joint venture additions	Note 12	29,765
Sales proceeds	Consolidated cashflow	(3,357)
Total Outturn		644,821

An analysis of this summary result is provided below.

Consolidated net expenditure for the year increased by £64.2 million (from £476.1 million to £540.3 million). The main factors causing the increase were:

- staff costs increased from £79 million to £93 million due to the inclusion of DLSL costs for the first time. The average pay increase was 3.5%;
- research grants increased from £78 million to £97 million due to the inclusion of £5 million of Nuclear Physics Grants. Also, the effects of Full Economic Costs (FEC) and of new projects caused increases Astronomy and Particle Physics Grants of £7 million and £9 million respectively. There was a compensating reduction in e-Science Grants of £3 million;
- services increased from £35 million to £45 million partly because £5 million of costs for DLSL were included for the first time; and
- depreciation increased by £25 million (from £37 million to £62 million) due to the share of the DLSL depreciation (£14 million) and the impact of the professional revaluation of plant and equipment assets in March 2007 and land and building assets in March 2008.

These increases were offset by:

- income from operating activities increased by £26 million (from £52 million to £78 million) due to the recognition of DLSL income;
- other grants and awards reduced by £5 million (from £34 million to £29 million) partly because special payments in 2006-2007 were not matched in 2007-2008; and
- other operating costs reduced from £26 million to £21 million mainly due to the receipt of two business rates rebates totalling £7 million.

Total government funds at 31 March 2008 amounted to £776.3 million (£756.7 million at 31 March 2007. See note 16). The major cause of this movement was the sum attributable to the investment in DLSL, £271.9 million (2006-2007: £255.6 million).

The Council has remained within its specific budgeted limits, comprising of in-year allocations and brought forward funding balances known as End of Year Flexibility agreed with DIUS.

Central Laboratory Innovation and Knowledge Transfer Limited (CLIK)

This company, a wholly owned subsidiary of STFC, was established at the start of 2002-2003 to manage and commercially exploit the intellectual property owned by its parent and seek to ensure the optimum exploitation of such property in the United Kingdom economy in accordance with HM Government policy. Throughout 2007-2008, CLIK continued to develop new and existing trading opportunities via the establishment of and participation in specific technology spin-out companies and the licensing of its intellectual property.

CLIK is currently actively managing 65 live patent families, 13 new patent applications have been filed during 2007-2008. It is also involved in six operating spin-out companies, with three more being developed.

It is considered unlikely that the nature of its business will materially change in the foreseeable future.

As is to be expected with a venture of this nature and well within its planned budgeted financing, CLIK incurred a trading deficit of £251,000 (2006-2007: £135,000 deficit). This loss was a substantial improvement on the budget set for 2007-2008 and is due to the company's steadily strengthening trading ability. Additionally, a reduction of £75,000 in the valuation of an existing investment compared with that held in 2006-2007 increased the overall Recognised Loss to £326,000 (2006-2007: £2,000 Recognised Gain). The operating results, assets and liabilities of CLIK are reflected in the Council's group accounts in accordance with generally accepted accounting standards.

Diamond Light Source Limited (DLSL)

Throughout the year, STFC continued to be the major shareholder in the DLSL, a Joint Venture established with the Wellcome Trust Limited for the construction and operation of the Diamond facility, a third generation, medium energy, synchrotron radiation source. STFC's 86% shareholding is treated as an investment in the STFC's accounts.

With the completion and commissioning of the first phase of the facility by the end of 2006-2007, 2007-2008 was the first year of operations for DLSL. In addition to commencement of operations, DLSL continued construction work on the second phase of the facility. DLSL's accounting policy is to capitalise all expenditure during the construction phase. Accordingly this investment in the second phase is shown in STFC's consolidated balance sheet. For 2007-2008, STFC's share of DLSL's Operating Loss on consolidation was £1.3 million (2006-2007: £502,000 surplus).

Creditor payment policy

The Council observes the Confederation of British Industries' Code of Practice. The Council adheres to the principle of the prompt payers code and makes every effort to comply with the agreed terms of payment of creditors valid invoices for goods and services received. During 2007-2008 the percentage of all invoices received by the Council which were paid within 30 days was 93% [2006-2007: 96% (average of the two predecessor Councils)]. The Council makes purchases using the Government Procurement Card (GPC) and the percentage of invoices paid within 30 days includes purchases made using the GPC.

GOVERNANCE

The Science and Technology Facilities Council is an independent, non-departmental public body of the Department for Innovation, Universities and Skills (DIUS).

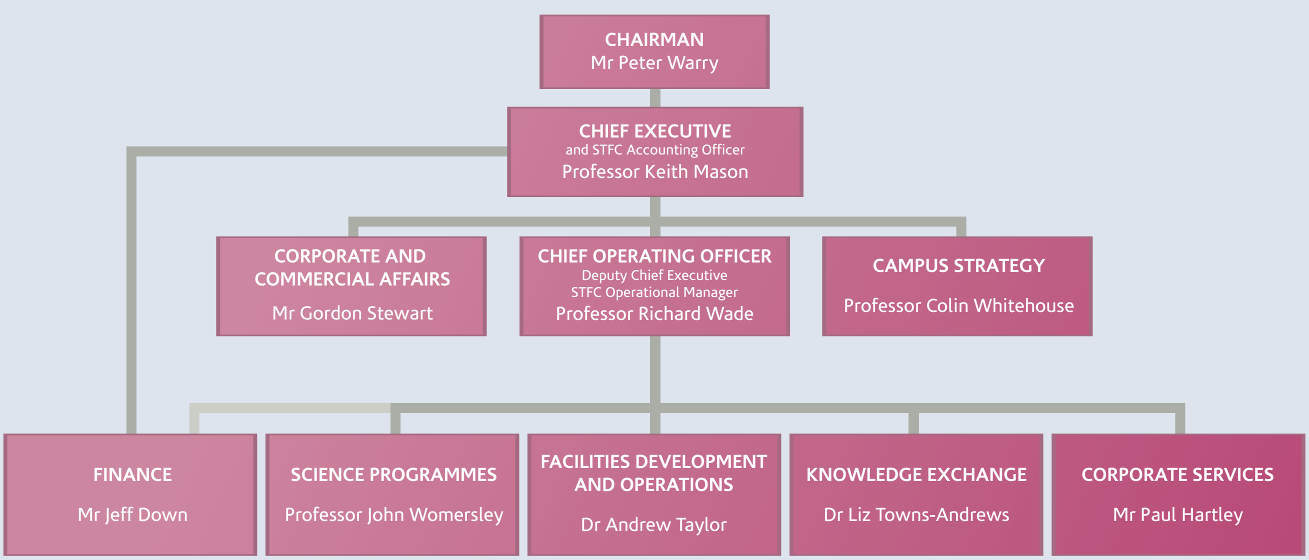
Ultimately STFC is accountable to the public through Parliament for the funds it expends. Parliament monitors and influences the Council's work through its Select Committees and the Parliamentary Ombudsman. The Select Committees most relevant to STFC are:

- House of Commons Innovation, Universities, Science and Skills Committee
- House of Commons Business and Enterprise Committee
- House of Commons Committee of Public Accounts
- House of Lords Science and Technology Committee

The STFC's working relationship and lines of accountability with its sponsor department DIUS are defined through a Management Statement and Financial Memorandum, which are subject to periodic review.

Governance arrangements

The STFC's senior management structure has continued to evolve during 2007-2008. The diagram below illustrates the structure as at 31 March 2008.



Executive Board and its Committees

An Executive Board comprised the senior executive of STFC was established in January 2008 as the main forum through which the Chief Executive Officer (CEO) would lead and manage the STFC and receive advice/information from the senior management team. The Executive Board has responsibility for the general supervision of STFC affairs and ensuring that the decisions of Council are carried out. In addition, the Executive Board acts as the Project Board for the Restructuring Project, led by Professor Richard Wade, the Chief Operating Officer. Through the Restructuring Project, the Board will identify and implement the changes required to reshape the STFC to ensure it delivers on its objectives while making the efficiency savings required by the latest Comprehensive Spending Review.

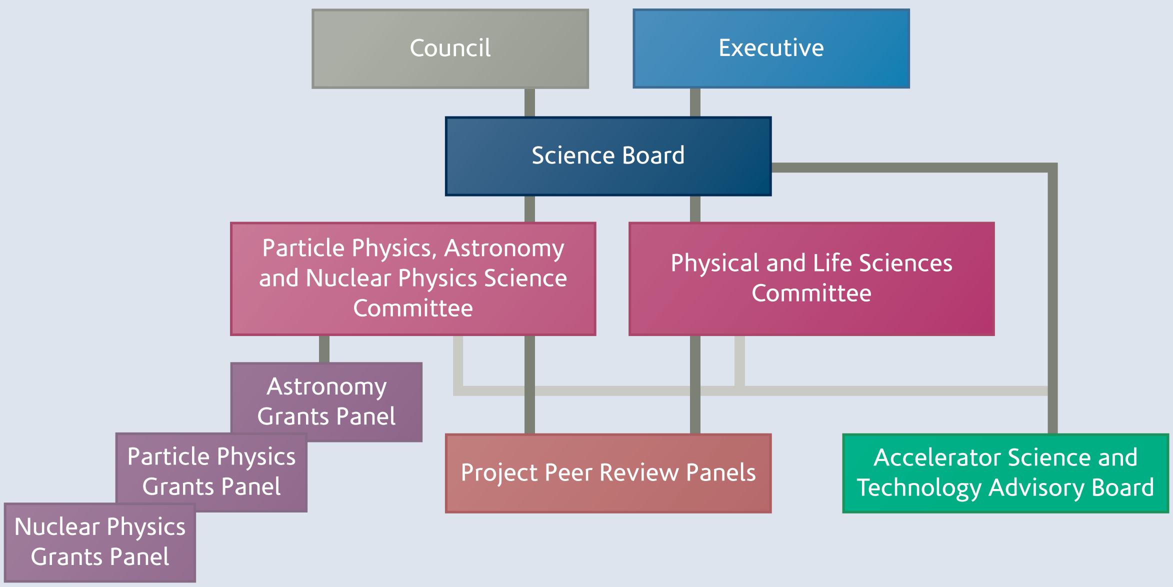
Membership and attendance 2007-2008:

		Attendance
Chair	**Professor Keith Mason** Chief Executive	4/4
Members	**Mr Jeff Down** Director Finance	4/4
	Mr Paul Hartley Director Corporate Services	4/4
	Mr Jim Sadlier Director Corporate Planning and Communications	4/4
	Mr Gordon Stewart* Director Corporate and Commercial Affairs	1/1
	Dr Andrew Taylor OBE Director Facilities Development and Operations	4/4
	Dr Liz Towns-Andrews* Director Knowledge Exchange	1/1
	Professor Richard Wade Chief Operating Officer	4/4
	Professor Colin Whitehouse FREng Director Campus Strategy	4/4
	Professor John Womersley* Director Science Programmes	1/1

* Joined the Executive Board after the third meeting

To assist it in this role, the Executive Board drew on advice from various Boards, Committees and Panels which reported to it.

Advisory structure As at 31 March 2008



Risk management

Facilitating leading edge science and developing world-leading technology are the goals of the STFC and cannot be achieved without risk taking. Accordingly, the identification, analysis and management of risk is inherent in much of what the Council does. Where the potential scientific return is high, therefore, STFC embraces risk. In areas such as financial management and health and safety, however, the Council's appetite for risk is minimal. The STFC has established a risk management framework consistent with these principles while adopting a systematic approach to risk assessment and management. This framework is compliant with HM Treasury's 'Orange Book' (October 2004) and consistent with the 'Risk Management Assessment Framework – A Tool for Departments (HM Treasury, October 2004)'.

In 2007-2008, the Council introduced a revised management structure for risk to help shape a new corporate risk register linked to performance evaluation. The Audit Committee supported by an executive committee (Risk Advisory Group) oversees governance, risk and controls matters across the organisation.

Merger

On 25 July 2006 the then Department of Trade and Industry announced that the Government would create a large facilities research council. The Council would take over the responsibilities of the Council for the Central Laboratory of the Research Councils (CCLRC), the Particle Physics and Astronomy Research Council (PPARC) and nuclear physics grant awarding from the Engineering and Physical Sciences Research Council (EPSRC). On 9 November 2006 Lord Sainsbury, the then Minister for Science and Innovation, announced that new council would be called the Science and Technology Facilities Council (STFC).

The aim of STFC is to:

- create a more integrated approach to large facilities, including international negotiations, for long-term projects involving several countries acting together;
- obtain more value from the knowledge and technologies that are developed as a result of the new Council's programmes; and
- deliver both of the above goals using the two Science and Innovation campuses at Daresbury and Harwell as identifiable knowledge transfer centres which host UK based large scale international facilities.

A joint CCLRC and PPARC project was set up to create the new Council and enable operation from 1 April 2007. Project oversight was provided by the then Office of Science and Innovation (OSI). Included among the project deliverables was a new Charter, a new Council, a new senior management team, a finance infrastructure that would operate from commencement, a new organisational structure and new advisory structure.

COUNCIL AND ITS COMMITTEES

The Council

The Council, STFC's governing body, was appointed in April 2007 by the Minister for Science and Innovation. The Council is comprised of a combination of academics and executive and non-executive directors from industry.

The Council's terms of reference reflects its responsibility to the organisation, and its commitment to an integrated approach to large facilities, including international negotiations, and to ensure that the STFC delivers its goals, upholds its responsibility towards its stakeholders, users, members of the public and staff.

Council membership and attendance 2007-2008:

		Attendance
Chairman	**Mr Peter Warry FREng** Chairman of Victrex plc and BSS Group plc	12/12
Chief Executive	**Professor Keith Mason**	12/12
Members	**Professor Keith Burnett CBE FRS** University of Sheffield	6/12
	Mr Marshall Davies Independent Advisor	12/12
	Professor Michael Edmunds FRAS FInstP University of Cardiff	11/12
	Mr Philip Greenish CBE Royal Academy of Engineering	12/12
	Dr Philip Kaziewicz GI Partners	12/12
	Professor Anneila Sargent FRSA California Institute of Technology	11/12
	Professor Richard Wade STFC	12/12
	Professor Colin Whitehouse FREng STFC	12/12

In accordance with the Council's Royal Charter, members were appointed by the Minister for Science and Innovation for a term of office not exceeding four years. With the exception of the Chief Executive, Professor Wade and Professor Whitehouse, all the above-named were deemed to be independent in character and judgement. Any financial or business relationships with STFC were listed in the Register of Members' Interests and in the Related Party Transactions (see note 22 to the Annual Accounts).

Mr Marshall Davies was assigned responsibility for investigating and advising on confidential whistle-blowing cases.

Mr Paul Williams, Department for Innovation, Universities and Skills, was observer to STFC Council during 2007-2008 on behalf of the Secretary of State for Innovation Universities and Skills.

Minutes of the Council's meetings are available on the STFC website at www.scitech.ac.uk/About/Strat/Council/council.aspx

Register of Members' Interests

A register of Council Members' private, professional and commercial interests was maintained by the Council. The register is also available on the STFC website [see www.scitech.ac.uk/About/Strat/Council/register.aspx].

Political and charitable gifts

The Council made no political or charitable gifts during the year.

Committees

Audit Committee

The Council has established an Audit Committee to review internal and external audit matters, internal control and risk management, and the Council's accounts. The Committee met five times during the year.

The Audit Committee's Terms of Reference were ratified at the first meeting of the Council. The committee is due to produce an annual report on its activities in October 2008.

Membership and attendance 2007-2008:		Attendance
Chair	**Mr Marshall Davies** Council Member	5/5
External members	**Dr Derek Chadwick** Novartis Foundation	5/5
	Mr Rob Low Independent Advisor	5/5
	Mr Ric Piper MA FCA Independent Advisor	4/5

Remuneration Committee

The remuneration of the senior staff in STFC is determined by the Council's own Remuneration Committee. See the Remuneration Report (page 96-100) for further details. The Committee met five times during the year.

Membership and attendance 2007-2008:		Attendance
Chair	**Mr Philip Greenish CBE** Council Member	5/5
Members	**Professor Keith Mason** Chief Executive	4/5
	Mr Marshall Davies Council Member	5/5
	Mr Paul Hartley STFC (Secretary)	5/5

Notes: The last meeting of the PPARC Remuneration Committee was held on 20 July 2007; members and those present were Mr Colin Paynter (Chair), Professor John Inkson FInstP, Professor Keith Mason (CEO), Mr Paul Hartley (Secretary). The final CCLRC Remuneration Committee meeting was held on 25 June 2007; members and those present were Sir Graeme Davies FREng (Chair), Professor John Wood CBE FREng (CEO), Mr Marshall Davies, Ms Anne Kensall and Mr Paul Hartley (Secretary).

Science Board

The Science Board provides advice to Council and the executive on all aspects of STFC's science and technology programme. The Science Board met seven times during the year.

Membership and attendance 2007-2008:		Attendance
Chair	**Professor Sir Peter Knight** Imperial College London	7/7
Members	**Professor Jenny Thomas** University College London (Deputy Chair)	7/7
	Professor Gabriel Aeppli London Centre for Nanotechnology	7/7
	Professor John Ellis CERN	5/7
	Professor Monica Grady Open University	7/7
	Professor Matt Griffin University of Cardiff	6/7
	Professor Douglas Kell University of Manchester	6/7
	Professor Tony Ryan University of Sheffield	5/7
	Professor Walter Gear (Chair of PPAN) University of Cardiff	5/7
	Professor Jordan Nash (Deputy Chair of PPAN) CERN	5/7
	Professor Tim Wess (Chair of PALS) University of Cardiff	6/7
	Professor Chick Wilson (Deputy Chair of PALS) University of Glasgow	5/7

Minutes of Science Board meetings are available on the STFC website at **www.scitech.ac.uk/About/Strat/Council/AdCom/SciBrd/contents.aspx**

See page 138 for membership details for other STFC panels and committees.

Further details on the STFC Council and its advisory committees are available on the STFC website at www.scitech.ac.uk/About/Strat/Council/council.aspx

Freedom of Information

During 2007-2008, STFC received 146 requests for information. Eighty-two requests were dealt with under the Freedom of Information (FoI) Act 2000. Five requests were extended over the 20 working day period specified in the FoI Act; the requestors were kept informed of progress. Sixty-four requests were dealt with under the Data Protection Act; all requests were completed within the 40-day period specified under the Act.

STFC is currently in the process of developing its Freedom of Information and Data Protection Policies, and Publication Scheme.

Auditors

Internal audit was provided by the Research Council's Internal Audit Service. The accounts of the Council were audited by the Comptroller and Auditor General of the National Audit Office (NAO), under the terms of Section 2(2) of the Science and Technology Act 1965. The fee for 2007-2008 was £115,000 [2006-2007: £118,000 (£60,000 for ex-CCLRC and £58,000 for ex-PPARC, also audited by the NAO)]. No non audit work was undertaken by the NAO during 2007-2008.

So far as the Accounting Officer is aware, there is no relevant audit information of which the Council's auditors are unaware. The Accounting Officer has taken all the steps that he ought to have taken to make himself aware of any relevant audit information and to establish that the Council's auditors are aware of the information.

PERFORMANCE AND RELATED TRENDS

This report covers the first year of operation of the Science and Technology Facilities Council (STFC) merging together the planned deliverables from its predecessor organisations PPARC and CCLRC for 2007-2008 and the final year of the SR2004 reporting period.

Performance management

The Council's performance is reviewed formally through the DIUS (Department for Innovation, Universities and Skills) Performance Management System. First introduced in 2005-2006, this comprises:

- the Delivery Plan which sets out research council plans and programmes for the period 2005-2006 to 2007-2008 [see www.scitech.ac.uk/deliveryplan]. The first STFC Delivery Plan, published in August 2007, described the Council's plans and key deliverables for the period 2007-2008 to meet the Government's two Public Service Agreement (PSA) targets:
  - to sustain and improve the competitive performance of the UK science and engineering base (health of the discipline); and
  - to increase industrial involvement with and knowledge transfer from the science base.

The document set out plans and targets which were already in train or were firm commitments and some new targets aimed primarily at developing distinct strategies and plans for the STFC moving forward into the 2007 Comprehensive Spending Review (CSR07) period. Both the Delivery Plan and Scorecard are reviewed and refreshed annually to reflect the changing priorities of the Council;

- the complimentary Scorecard which lists more detailed key, strategic-level deliverables and associated metrics and targets derived from the STFC Delivery Plan [see www.scitech.ac.uk/resources/pdf/stfcscorecard0708.pdf]; and
- the Economic Impact Reporting Framework (EIRF) which focuses on the contribution an individual research council makes to achieve the Public Service Agreement target and performance [see www.rcuk.ac.uk/aboutrcuk/eirf].

Performance against the targets, milestones and metrics defined in these documents is monitored routinely by DIUS through the use of quarterly reports and 'traffic light' based reporting system. The Scorecard is reviewed by Council and submitted to DIUS for comment.

The Council is also required to produce an Annual Delivery Plan Report which will include a summary of progress against the Scorecard targets and data on the Economic Impact Reporting Frameworks (EIRF). The first STFC Annual Delivery Plan Report is due to be published in July 2008 [see www.scitech.ac.uk/about/strat/council/dpannrep.aspx].

In 2007-2008, STFC reported against 91 detailed ongoing targets, 18 at the strategic-level, of which 94% were met in full by the target date. Seven targets that were classed as 'amber', at risk, were of a strategic nature [see the Annual Delivery Plan Report for further details]. Those deliverables that were not met during the year are expected to be achieved in full by the next reporting period.

Throughout 2007-2008 STFC continued to maintain high quality service to users of the existing facilities (ISIS, Central Laser Facility (CLF), Synchrotron Radiation Source (SRS), Diamond Light Source and the Isaac Newton Group (ING), La Palma, and Joint Astronomy Centre (JAC), Hawaii, ground-based telescopes) whilst developing programmes of on-going development to sustain their operational performance and enhance their capabilities.

Examples of major achievements throughout this reporting period are:

- population of the new elements of the science advisory structure;
- completion of an audit of in-house research programmes;
- development of an initial draft of a science and technology strategy for STFC;
- production of the first STFC 10-year plan in March 2008;
- operation of the major facilities at high levels of reliability and user satisfaction.

Performance data:

- first protons were extracted into ISIS Target Station 2 on 14 December 2007;
- -continued development of collaborative links for international access to ISIS and the CLF;
- -Diamond Light Source Ltd reached its target of seven commissioned beamlines.
- delivery of the UK's contribution to the Large Hadron Collider on schedule and to budget;
- agreement of the level of UK participation on the Gaia Data Processing and Analysis Consortium;
- delivery of SCUBA 2 to the James Clerk Maxwell Telescope at the JAC, Hawaii;
- establishment of new programmes in Computational Science and Engineering to strengthen support for the application of methods in biological sciences;
- increase of the volume of quota studentships by 50%;
- progressed implementation of the Large Hadron Collider public engagement strategy; and
- effective contribution to the development of the Shared Services Centre ensuring its design meets STFC's business needs.

Performance targets achieved

The SRS provided users with access to 691 beamtime slots, with a user satisfaction rate of 86% against a target of 85%, indicating the continued high performance of the facility.

ISIS delivered 382 experiments in the period October 2007 to March 2008 for its user community, produced 326 mA-hr of beam and registered a user satisfaction of 90.2% over a range of 15 indicators. In 2007-2008 ISIS underwent a long planned shutdown in order to enable some extensive obsolescence work to be carried out and to prepare the ISIS synchrotron for the extraction of the second proton beam for the new second target station. The major obsolescence programme achieved, amongst others: total refurbishment of the upper half of the extracted proton beamline, installation of a new hydrogen moderator control system following recent changes in legislation and replacement of the zinc bromide shield window in the target station manipulator area. As a consequence of this long-term investment in the ISIS facility, the effective user programme was reduced in this year.

The Central Laser Facility comprises the Lasers for Science Facility (LSF), the Laser Loan Pool, Astra and Vulcan. In 2007-2008, the CLF scheduled 203 weeks of user time for 49 experiments and recorded a user satisfaction of 90%. The Laser Loan Pool made nine laser loans over the year.

Diamond, in its first year of operation, provided 164 experiments with 81% of users reporting good or excellent satisfaction rates.

During 2007-2008, STFC ensured access for the UK research community to a significant proportion of Europe's major research facilities: 22.5% of public access to the neutron source at the Institut Laue-Langevin (ILL) and 15.4% of public access to the European Synchrotron Radiation Source (ESRF), both in Grenoble, France.

In terms of the ground-based telescopes, access for the UK to the ING was 47.6%, with 88% of users reporting good or excellent performance of the telescopes. At the JAC, UK access was 49.5% for the James Clerk Maxwell Telescope (JCMT) and 85% for the UK Infrared Telescope (UKIRT).

OPERATIONAL INITIATIVES

During 2007-2008, the STFC continued to take forward four major capital projects supported through the Large Facilities Capital Fund, namely:

- Diamond Light Source Ltd – Phase II (funded by STFC 86% and Wellcome Trust 14%)

  Phase I construction concluded at the end of December 2006 and was delivered on time and within the approved budget of £263 million.

  For Phase II, Diamond's approved budget is £120 million to allow the construction of a further 15 beamlines. Phase II was officially announced in October 2004 by the then Science Minister, Lord Sainsbury. To date, Diamond has spent £40 million and completion of the Phase II project is forecast to be on time (in 2011) and within the approved budget. The first Phase II beamline became operational in July 2007 and an additional three Phase II beamlines will be operational by Summer 2008.

  Diamond is equipped with state-of-the-art experimental stations to allow researchers from the UK and around the world to carry out groundbreaking research in the biological, physical, environmental and engineering sciences. Research is being carried out in such fields as the study of protein structures involved in the development of new drugs, or diseases like tuberculosis, HIV or cancer to name a few. New chemical processes can be understood – new materials developed – conditions deep down into the earth replicated – and archaeological specimens authenticated.

- ISIS Second Target Station and the first set of instruments (budget £102.3 million in SR04)

  Building on the success of the ISIS pulsed neutron facility, the Second Target Station will provide a qualitatively different source of neutrons at ISIS which will be exploited by a new suite of instruments to provide unique research facilities in soft matter, bio-molecular science, and advanced materials. During Summer 2007, a period of very intense activity saw installation of the fast extract kicker magnets in the synchrotron and completion of the new extracted proton beam line. A major milestone was achieved in December 2007 when protons were successfully delivered to the new target station on schedule. On target to begin science operations in October 2008, the project is progressing well and remains on budget.

- Energy Recovery Linac Prototype (budget 2.5 million)

  Strategic reviews of the Energy Recovery Linac Prototype (ERLP) project concluded that it had a role as a next generation technology demonstrator and a test bed for developing novel photon science in association with advanced laser systems. As a result the project was renamed as ALICE (Accelerators and Lasers In Combined Experiments) in January 2008 to reflect its new and evolving role. ALICE will explore the generation and manipulation of extremely high brightness electron beams, and will provide invaluable experience as a precursor to a new light source. Progress in 2007-2008 included the full commissioning of ALICE's 2K cryogenic system, the largest ever operated in the UK, and of the two advanced superconducting radio frequency accelerator modules, another UK first. Despite some delays due to failures of complex components, the project will now move into its major beam commissioning phase, with initial demonstration of energy recovery anticipated in late 2008.

- Muon Ionisation Cooling Experiment (MICE) Phase 1

  An essential first step towards the realization of a neutrino factory is to develop techniques to control the muon beams entering the storage ring. The aim of the international Muon Ionisation Cooling Experiment (MICE) collaboration is to demonstrate the technology that will be required for the factory by building a short section of a muon cooling channel. The first phase of MICE, which involved the creation of a new muon beam on ISIS, was successfully completed in January 2008. During 2007-2008, the mechanical installation and test of the pion production target in the ISIS proton synchrotron accelerator was completed, the pion decay line was built and beam counters and other equipment were installed in the experimental hall. The project continues to make good progress and is on target for delivery by 2011.

The Daresbury and Harwell Science and Innovation Campuses

During 2007-2008 the following key milestones were achieved, taking the UK a significant step closer to the realisation of the Campus Vision (see page 14):

Daresbury Science and Innovation Campus (DSIC)

- April 2007 – Professor Swapan Chattopadhyay appointed Inaugural Director Cockcroft Institute;
- October 2007 – 50 tenant companies in the Daresbury Innovation Centre reached;
- October 2007 – DSIC website launched;
- March 2008 – DSIC Masterplanning report (the Daresbury Framework) completed;
- March 2008 – rolling programme for construction of further buildings on the Campus agreed with the developers.

Harwell Science and Innovation Campus (HSIC)

- May 2007 – the Joint STFC/United Kingdom Atomic Energy Authority (UKAEA) Project Team issued the Invitation to Negotiate (ITN) for the HSIC Joint Venture Private Partner to three short-listed candidates from the Outline Proposal stage;
- July 2007 – in response to the ITN, bids from two of the three invited candidates were received in July 2007 and initial negotiations with both parties were undertaken to clarify and finalise their bids during August 2007;
- September 2007 – the two remaining HSIC Joint Venture Private Partner candidates' bids were scored against the selection criteria set out in the ITN. Based upon this scoring, the recommendation for the preferred bidder was approved by the Project's Executive Strategy Group and negotiations with this bidder were initiated;
- November 2007 – HSIC Business Case was approved by the UKAEA Board and STFC Council and the negotiations with the preferred partner commenced;
- February 2008 – formation of the Public Sector Partnership between STFC and UKAEA; and
- March 2008 – development of the 'Land for Big Science' agreement to reserve Campus land for the STFC to develop large science facilities in the future.

Infrastructure Sustainability Programme

In 2007-2008 STFC, through the Infrastructure Sustainability Programme, continued to tackle the long list of outstanding work services required for the various sites in order to meet legislative requirements and improve the overall condition of the Council's estate. Throughout the STFC estate, the ageing infrastructure is in need of further remedial work and the associated maintenance costs of the older buildings continues to rise.

In Edinburgh, the UK Astronomy Technology Centre continued its ongoing programmes to replace flat roofs with new, better-insulated roofs, upgrading of fluorescent light fixtures to improve working conditions, building access ramps and installing automated doors to comply with the Disability Discrimination Act 1995.

At Daresbury Laboratory the estate has benefited from the demolition of some redundant buildings, upgrading of the power supply, lone worker and access control systems to all buildings, together with digital internal and external CCTV to increase the overall site security and support emergency planning. The restaurant has undergone a major refurbishment and several buildings have had replacement glazing systems installed or been re-roofed from flat to apex roofs to improve their appearance and, more importantly, to dramatically improve the levels of insulation. Throughout the year work has continued to prepare the estate for the next phase in the development of the Daresbury Science and Innovation Campus.

The Rutherford Appleton Laboratory has been similarly busy with significant investment in the re-cladding of buildings and replacing electrical switchgear, which was installed in the 1950's, to cope with future demands. Emergency lighting has also been upgraded in many buildings. The programme to replace old, inefficient steam boilers has continued which will ultimately improve the reliability of heating buildings across the site whilst reducing the amount of gas used by up to 70% and considerably reducing the site's average daily water consumption.

Work on a new computer building started at the Rutherford Appleton Laboratory in August 2007. Due to house the UK Tier 1 Centre, it will support the Large Hadron Collider and a Scientific Data Curation Facility as well as offices for the Campus Information and Communications Technology group. The estate has also been preparing for the next phase in the development of the Harwell Science and Innovation Campus.

PERSONAL DATA RELATED INCIDENTS

Incidents, the disclosure of which would in itself create an unacceptable risk of harm, may be excluded in accordance with the exemptions contained in the Freedom of Information Act 2000 or may be subject to the limitations of other UK information legislation.

Table 1: Summary of protected personal data related incidents formally reported to the Information Commissioner's Office in 2007-2008

Date of incident (month)	Nature of incident	Nature of data involved	No. of people potentially affected	Notification steps
Not applicable	None	None	Nil	Not applicable
Further action on information risk	STFC will continue to monitor and assess its information risks in order to identify and address any weaknesses and ensure continuous improvements of its systems			

Table 2: Summary of other protected personal data related incidents in 2007-2008

Incidents deemed by the Data Controller not to fall within the criteria for report to the Information Commissioner's Office but recorded centrally within the STFC are set out in the table below. Small, localised incidents are not recorded centrally and are not cited in these figures.

Catagory	Nature of incident	Total
I	Loss of inadequately protected electronic equipment, devices or paper documents from secured Government premises	Nil
II	Loss of inadequately protected electronic equipment, devices or paper documents from outside secured Government premises	Nil
III	Insecure disposal of inadequately protected electronic equipment, devices or paper documents	Nil
IV	Unauthorised disclosure	Nil
V	Other	Nil

Table 3: Year-on-year total numbers of protected personal data related incidents prior to 2007-2008

Total number of protected personal data related incidents formally reported to the Information Commissioner' Office:

Year	Category					Total
	I	II	III	IV	V	
2006-2007	Not applicable – no data					
2005-2006	Not applicable – no data					

Total number of other protected data related incidents:

Year	Category					Total
	I	II	III	IV	V	
2006-2007	Not applicable – no data					
2005-2006	Not applicable – no data					

Statement and actions on managing risk

As the STFC was formed on the 1 April 2007, only the incidents for 2007-2008 have been reported.

The STFC has in place arrangements to monitor and assess its information risks and will continue to identify and address any weaknesses and ensure continuous improvements of its systems.

During 2007-2008 the Council established the IT Strategy and Oversight Committee (ITSOC), jointly chaired by two Directors, to replace the previous CCLRC and PPARC Information Governance structures. ITSOC is supported by sub-committees and working projects, some of which are directly related to information security.

As the primary business of the STFC is to support, run and develop large scale scientific facilities for open academic research within the UK and abroad, the majority of information assets do not attract any form of protective marking such as PROTECT or higher.

HEALTH, SAFETY AND ENVIRONMENT ISSUES

In its first year of operation the STFC has maintained a safe and healthy working environment for its employees, contractors working on its behalf, tenants located at the laboratories, visitors to sites and users of facilities. The STFC Health and Safety Policy, developed during early 2007, was launched by the Chief Executive to all staff on merger. The policy was revised and re-launched as the respective health and safety management systems of the former Councils were consolidated, building mainly upon the former CCLRC health and safety management system, comprising policies, codes, notices and procedures.

Health and safety management in the STFC is based on the establishment of clear line management responsibility for health and safety. In addition the Chief Executive appoints Directors at the major STFC laboratories to maintain an independent overview of health and safety on the site, to monitor the implementation of Council Policy, and to bring to his attention the need for any action to improve health and safety performance.

Safety committees are a key component of the STFC safety management system. These met on a regular departmental basis and collectively for each site, and include management and employee representatives. They considered accident reports, injury statistics and proposed codes, and provided a forum through which employee safety representatives raise areas of concern. The terms of reference, focus and coverage for such committees was reviewed during 2007-2008 and new committees established to reflect the developing organisation structure. Reflecting the importance of the health and safety agenda a dedicated STFC Safety, Health and Environment (SHE) Committee was established to provide strategic leadership for SHE issues. The STFC SHE Group, Occupational Health professionals and facility Radiation Protection Advisers (RPAs) monitored safety performance and advised the Directors, and departmental and site safety committees.

During 2007-2008 the STFC made considerable progress in addressing the findings of the independent assessment of the CCLRC SHE management system undertaken in 2006:

- Formal SHE training for all management from Director and senior manager to first line manager has been piloted and deployed;
- Ten priority SHE codes have been developed and launched across the STFC and further codes developed in draft, including a draft SHE audit code addressing a key assessment finding;
- Departmental SHE improvement plans have been established to review and drive SHE management;
- The STFC risk assessment process has been reviewed and risk assessments established in a centralised IT system; and
- The profile of SHE communication has been raised through the launch of SHE codes, and through the pro active sharing of learning from incidents with wider Council relevance.

Progress in this programme was reviewed and audited by the Research Councils Internal Audit Service (RCIAS) who reported ‘Substantial Assurance’.

The principal STFC laboratories, Daresbury (DL) and Rutherford Appleton (RAL), both received Royal Society for the Prevention of Accidents (RoSPA) Awards, for their health and safety management practices and overall health and safety performance. For the first time DL received a RoSPA President’s Award for ten consecutive years of Gold Awards, building upon the President’s Award for RAL last year.

Accident and near miss reporting and investigation continue to be primary drivers of improvement in health and safety management systems, and provided the basis of objective reporting of health and safety performance. During 2007-2008 the STFC consolidated the reporting systems and performance of the CCLRC and PPARC based upon a web based incident reporting system. A focus upon near miss reporting has successfully increased numbers reported from 50 in 2005-2006 and 97 in 2006-2007 to 147 in 2007-2008 – each reported near miss provides the STFC with the opportunity to address its root cause and avoid future incidents.

STFC injury statistics from the financial years 2003-2005 to 2007-2008 are presented in the table below. The table consolidates health and safety statistics of the CCLRC and PPARC for previous years; the overall statistics mainly reflect the performance of the former CCLRC, as the larger of the previous organisations.

Statistics	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008
Total Injuries to Employees	94	106	96	111	116
Total Injuries to Contractors	23	19	37	50	25
Total Injuries to Users/Visitors/Tenants	9	13	11	13	16
All Injuries	**126**	**138**	**144**	**174**	**157**
Reportable* Injuries to Employees	11	2	8	13	8
Reportable* Injuries to Contractors	-	-	3	-	1
Reportable* Injuries to Users/Visitors/Tenants	1	1	-	-	2
All Reportable Injuries	**12**	**3**	**11**	**13**	**11**
Reportable Injuries per 1,000 Employees*	**5.24**	**0.95**	**3.81**	**6.19**	**3.81**

* Injuries which must be reported to the Health and Safety Executive (HSE) under the Reporting of Injuries, Diseases, and Dangerous Occurrence Regulations (RIDDOR), including all that result in more than three days absence from work.

The total number of injuries reported in 2007-2008 was 157 – a reduction of 17 on 2006-2007 – reflecting a significant reduction in the number of reported contactors injuries. At 116 the number of injuries to employees is the highest reported, though this is not considered a statistically significant increase and may reflect the increasing focus on incident reporting in the STFC. The number of reportable injuries, 11, in 2007-2008 is consistent with those reported in previous years, as is that for reportable injuries per 1,000 employees.

When the STFC was established, liability for employment-related matters and historical liabilities transferred to it from the Rutherford Appleton and Daresbury Laboratories as well as the Chilbolton Observatory and the UK Astronomy Technology Centre (UK ATC). The buildings at these sites date from the period when asbestos was a widely used building material, primarily in lagging and insulation. Managed early removal exercises were undertaken 20-30 years ago but there are still significant quantities of asbestos in the fabric of buildings and, in some cases, there is debris from previous removal. In accordance with Health and Safety Executive (HSE) recommendations, all asbestos has been recorded in the Asbestos databases, and the policy is to manage all asbestos and to remove it only where there is a risk that it will be disturbed or where it posed some other unacceptable risk.

In line with national statistics for musculo-skeletal health, back care remains of prime concern for STFC staff for which a 10% reduction has been noted in the year 2007-2008 compared to the preceding year. This is possibly related to improvements to in-house physiotherapy services and the Occupational Health team's involvement via management/human resources referrals.

During 2007-2008 the UKAEA gave notice that they would cease provision of the Harwell Fire and Ambulance service to the RAL site. Following discussion with local fire and ambulance authorities, and alongside Diamond Light Source Limited, alternative arrangements were put in place for April 2008. This provided the opportunity to create separate Emergency and First Aid responses tailored to the needs of RAL. As part of this programme the number of first aiders was increased by 60% to ensure 24/7 and full site coverage, oxygen treatment training was provided and additional defibrillators deployed across RAL.

Radiological safety

The radiation protection teams at RAL and DL, managed by accredited Radiation Protection Advisers (RPAs) based respectively in the ISIS neutron spallation and Synchrotron Radiation Source (SRS) facilities, are the responsibility of the Facilities Business Unit Director. Both RPAs also provided professional advice on radiation safety to all staff in the laboratories.

The formation of the STFC, in April 2007, from the merger of CCLRC with PPARC required both RAL and DL to re-apply to the Environment Agency for its Registrations and Authorisations to hold radioactive materials and dispose of radioactive waste. The HSE were notified of the changes in legal entity.

All statutory returns relating to the STFC's holding of radioactive materials were made on time to both the Environment Agency (EA) and European Atomic Energy Community (EURATOM).

The Laboratories have a number of sources that fall within the requirements of the HASS (High Activity Sealed Sources) Regulations. A significant administrative requirement is the need for STFC to have in place a mechanism guaranteeing any future disposal costs of these sources, currently estimated at £100,000. This financial guarantee in the form of a Certificate of Assurance was submitted to the EA. During the course of 2007-2008 health physics teams at RAL and DL reviewed the management of sealed radioactive sources within the STFC. Arising from this review was the development and launch of the STFC radioactive sealed source SHE code. Further radiation management SHE codes relating to unsealed materials and radioactive waste are planned for 2008.

Landauer Inc. continued to provide the STFC with an HSE approved dosimetry service during 2007 and made all statutory returns to both the HSE's Central Index of Dose Information (CIDI) and the Health Protection Agency's (HPA, formerly the National Radiological Protection Board) National Registry for Radiation Workers (NRRW). Personal doses continued to be low, with the majority of personal dosimeters having doses below the detector reporting level.

The highest personal radiation dose levels reported for staff at DL were well below the dose target of 1 mSv per person established for the Synchrotron Radiation Department. The annual dose limits for workers is 20 mSv and that for members of the public 1 mSv.

The following table presents the results of annual personal radiation dose monitoring for Classified workers at DL:

Dose (mSv)	0.00 - 0.09	0.10 - 0.19	0.20 - 0.29	0.30 - 0.39	0.40 - 0.49	0.50 - 0.59	0.60 - 0.69	0.70 - 0.79	0.80 - 0.89	>0.90
2003	22	4	1	-	1	1	-	-	-	-
2004	27	1	-	-	-	-	-	-	-	-
2005	25	-	-	-	-	-	-	1	-	-
2006	25	-	-	-	1	-	-	-	-	-
2007	26	-	-	-	-	-	-	-	-	-

At RAL on-going revision of local rules progressed and detailed, prior risk assessments were carried out for all new work involving ionising radiation hazards. An investigation was carried out concerning a reported high dose of up to 9mSv recorded on a personal dosimeter. The investigating panel determined that the dosimeter had been left in a high dose rate area and there was no personal exposure involved. There was no requirement for HSE notification.

The following table presents the results of annual personal radiation dose monitoring conducted at RAL:

Dose (mSv)	0.00 -0.09	0.10 -0.49	0.50 -0.99	1.00 -1.99	2.00 - 2.99	3.00 - 3.99	>3.99
2002	291	123	38	15	1	-	-
2003	265	142	18	13	4	-	-
2004	195	233	26	9	5	1	1
2005	235	210	22	3	-	-	-
2006*	223	232	18	4	2	-	-
2007	225	230	42	16	3	3	-

*2006 data restated due to late processing of dosimeters.

Annual personal doses remained within the upper dose range limit for ISIS for occupationally exposed workers, and below the dose target of 6mSv per person established for RAL. Annual personal doses remained below 0.3 mSv for other members of RAL and the public at large.

Environment

The STFC is developing its environmental management systems in accordance with the principles and standards of BS8555 using the Acorn scheme, a recognised management system standard. This standard, consistent with those for quality (ISO9000) and health and safety management (OHSAS18001), lays the basis for the establishment of a combined safety, health and environmental management system.

Environmental committees exist at the STFC's larger sites and provide a focus for environmental management locally. An Environment Officer has been established to co-ordinate a Council focus for the development Environmental Management Systems.

The STFC actively manages the recycling of waste materials at all sites. Specific items for which recycling schemes exist included printer cartridges, fluorescent tubes, computer monitors, drink cans, scrap metals, paper and cardboard. In addition, the re-distribution and re-use of furniture resulted in reduced costs and environmental impact, and ceramic mugs rather than disposable cups were re-introduced in some site canteens.

In collaboration with other research councils on the Polaris House site, 70% of all STFC waste is being recycled and a purchasing 'Green Product List' established for certain items. As part of Polaris House, the STFC Swindon Office plans to seek ISO14001 accreditation for its environmental Management Systems.

At the UK ATC a boiler replacement programme is in underway installing more efficient condensing units. A rolling programme to upgrade insulation standards on all flat roofs is underway improving energy efficiency.

Heating and energy efficiency remains a focus at DL, with similar projects to upgrade the thermal insulation of flat roofs. In addition the two largest office blocks at DL have been refurbished with modern double glazed units. The decommissioning of the Synchrotron Radiation Facility (SRF) at DL was the subject of an external environmental compliance review, which found only a few potential non-compliances and a number of areas for improvement. A plan is in place to ensure compliance with environmental legislative requirements during decommissioning of the SRS facility. Recycling of materials and equipment will be integral to this major project.

At DL waste management was contracted to Bagnall and Morris, a Wirral-based company which handled all site wastes, hazardous and non-hazardous, including biological waste. The contract covered sorting, processing and separating waste and resulted in up to 40% of the waste being recycled, in particular paper, cardboard, glass and plastics. The DL site repeated its successful participation in the 'Carbon Off' scheme.

At RAL the on-going monitoring on power use has resulted in the identification of anomalous electricity usage in certain areas. Further investigation has resulted in significant energy savings. A heat loss survey of the RAL site has been undertaken, the results of which will be used to improve the thermal efficiency of existing buildings. It is intended that the RAL Research Complex, due to be constructed, will incorporate an 'earth tube' to pre-heat/cool ventilation air to reduce the overall energy requirements of the building.

DL received Environment Agency (EA) notification of a minor, 0.5°C, infringement of its cooling water discharge consent to the Bridgewater Canal. This was withdrawn after a subsequent scheduled sampling.

The ISIS Facility at RAL through its normal operation produces small quantities of radioactive solid, liquid and gaseous wastes. The gaseous wastes, mainly tritium and short-lived radioactive nuclides, are discharged into the atmosphere via authorised and monitored ventilation stacks. The measured gaseous radiation levels were well within the authorised annual limits of 2,500 GBq for tritium and 200 TBq for other nuclides. During a visit to RAL, the EA inspector was not satisfied with aspects of documentation for control of radioactive materials, specifically accountancy, of closed sources, procedures for processing of wastes, the management system, its organisational structure and resource. The EA issued an enforcement notice in March 2008; an STFC project has been established to resource and address issues raised.

SOCIAL AND COMMUNITY ISSUES

Employee relations and communication

The creation of STFC created a new subject for engagement with employees and their trade union representatives on a wide range of topics. Both predecessor Councils had long traditions of effective joint working and partnership with employee representatives both informally and through the Whitley arrangements, and these were quickly brought together under STFC. During the year consultation and negotiation has taken place over a wide range of issues, highlights being a new cross-Research Council pay system, harmonised conditions of service for STFC, planning for the closure of the Synchrotron Radiation Source at Daresbury Laboratory and the outcome of the Comprehensive Spending Review.

During 2007-2008 it was crucial to ensure that information and the opportunity for comment were accessible to all employees. Various channels were deployed including staff talks, departmental briefings, the internal Communications intranet, and the distribution of notices and circulars. Communications following the comprehensive spending review announcement indicated that there was a need for more frequent opportunitites for staff to receive briefings from senior management and to ask questions. Arrangements were put in place at the end of the financial year to address this need, and monthly presentations and discussions are now being held at each STFC site. In a further new development, the Chief Operating Officer now runs an internal blog and, this having proved successful, an external blog will shortly be launched.

In line with the Public Interest Disclosure Act (1998) and the recommendations of the Committee on Standards in Public Life (2005), STFC has adopted a ‘whistle blowing’ process drawn from its predecessor bodies. Employees are encouraged to raise concerns with line management in cases where conduct is deemed to be contrary to the STFC Code of Conduct, to the above Committee’s Principles of Public Life and to the values of STFC as an organisation. Published and web-based advice and a confidential e-mail communication channel to a designated Council Member and a designated official within the Department for Innovation, Universities and Skills (DIUS) have been publicised and made available to all members of staff.

Equality and diversity

During 2007-2008, the STFC was a member of the Research Councils’ Equality and Diversity Advisory Group, a joint member of the Employers’ Forum on Disability and worked closely with the UK Resource Centre for Women in Science Engineering and Technology.

The Council is committed to equality of opportunity in the workplace. Equality and diversity, however, extends beyond simply complying with the law. It is also about ensuring that STFC benefits from the wider range of skills, experience and attitudes provided by a truly diverse workforce and in achieving this, ensuring that its employees are able to flourish.

In line with legislative requirements the Council is developing its disability and gender schemes which will include action plans for further improvements in these areas. A Director has been identified as STFC’s Diversity Champion and a Diversity Forum has been established to ensure that employees, including representatives from minority groups, are involved in the formulation and implementation of diversity action plans and initiatives.

In the interests of improving the gender balance among the SET (Science, Engineering and Technology) workforce and at management level the STFC supports a number of initiatives for female employees, including a leadership programme for senior women.

During the year the STFC featured as a case study in a research project carried out by Cranfield University into gendered boardrooms in SET organisations, the summary of which was published in the 2007 Female FTSE report.

As at 31 March 2008:

- The average age of employees in STFC was 43;
- 11% of employees were non-white. The majority of non-white staff were to be found in middle to senior management positions;
- 25% of all employees and 11% of SET employees were female. STFC, in addition to offering a range of flexible working patterns to support work-life balance, was also engaged in various initiatives to encourage women back into the workplace in science, engineering and technology posts, and to support employees through mentoring and network groups; and
- STFC had no accurate data on the numbers of disabled employees because employees were not required to declare disabilities and many chose not to do so. Less that 1% of staff were known to be disabled.

Learning and development

During 2007-2008 a range of learning and development opportunities were available to STFC staff to enable them to develop the skills they need to perform well in their current job roles and also to acquire the skills they will need to adapt to future changes. STFC invests significantly in developing the scientific, technical, specialist and managerial competencies of it people by providing on site courses and learning resources, supporting attendance at national and international conferences, encouraging and supporting staff to obtain professional qualifications and supporting a mentoring scheme. The STFC continues to run a highly regarded engineering apprentice scheme which has achieved Institute of Engineering and Technology (IET) accreditation, and a graduate training scheme which is accredited by the Institute of Mechanical Engineering (IMechE), the IET and the Institute of Physics (IoP).

Investors in People

At the time the STFC was formed the two originating Councils were both in 'retained recognition' as Investors in People (IiP). The STFC underwent its first IiP Review in December 2007, at which time it was assessed to meet the Standard on 6 out of the 10 indicators. Since then the Executive Board has reaffirmed its commitment to return the STFC to the full Standard and good progress has been made in progressing an action plan to address the areas identified for development – which focus mainly around the clarification and understanding of corporate strategy and management capability. The next Review is scheduled to take place in December 2008.

Shared Services Centre

The seven Research Councils have agreed to establish a Shared Services Centre (SSC) to be based in Swindon. The SSC will provide finance, grants, human resources, information systems, procurement and payroll operational services to each of the Councils and their Institutes. The Councils are setting up the SSC with the aim of reducing spend on administration through sharing and standardising processes.

The SSC has been incorporated during the year as RCUK Shared Services Centre Limited and is in the process of establishing itself to be ready for the transfer of services. There is a phased implementation plan for transferring the Councils' services during 2008-2010.

EPSRC is currently acting as 'host' for the SSC project on behalf of all the Councils and has contracted for the development and establishment of the SSC. The Councils have agreed to share all these costs and STFC's share is 20.54%. These costs to date have been accounted for in STFC's books as £956,400 expensed, £788,509 as provisions for redundancy and system termination costs and £3,224,471 as Assets in the Course of Construction.

The transition to SSC is regarded as a business critical project and is referred to in the Statement on Internal Control.

Remuneration report

REMUNERATION POLICY

Council Chair and Members

Remuneration rates for Council Chair and Council Members are the same across Research Councils. The Science and Research Group (SRG) within the Department for Innovation, Universities and Skills advises Research Councils of the rates they are required to pay and these are reviewed annually by SRG.

Chief Executive

The remuneration of all Research Council Chief Executives is determined by the Science and Research Group within the Department for Innovation, Universities and Skills.

Chief Executives are paid both a basic salary and performance pay comprising an annual and an appointment term bonus of up to 5 and 10% respectively. The basic salaries are derived from three pay bands, which reflect the differing sizes and responsibilities of the Councils. Each band has four increments and, subject to at least satisfactory performance, Chief Executives receive an increment each year until they reach the top of the scale. In addition it is practice that all amounts are revalorised in line with the Senior Civil Service.

At the beginning of each year, the Director General for Science and Research (DGSR), and the relevant Council Chair agree with the Chief Executive a set of annual performance objectives for him/her for the year. In addition a set of appointment term objectives are agreed early in the appointment, which are reviewed annually. At the end of the year the Chief Executive, Chair and an independent Council Member write an assessment of performance over the year, and the DGSR, with advice from colleagues, agrees an SRG assessment of overall performance and specific achievements against objectives for annual and appointment term objectives.

A Remuneration Committee established and chaired by the DGSR then meets to review the Chief Executives' performance and to agree its recommendations, taking into account the assessments and any comments in the papers.

The appointment term bonus is assessed each year and the amounts agreed are retained and are then paid out at the end of the appointment term. If the Chief Executive leaves early the Remuneration Committee may recommend a reduced bonus be paid depending on the circumstances.

Other senior employees

When STFC was created, a Remuneration Committee was established, as a standing committee of Council, to determine the remuneration of the senior staff in STFC. In addition, for 2007 only, the Remuneration Committees of the predecessor Councils were retained to determine performance related bonus payments due to ex-CCLRC and ex-PPARC senior staff in respect of service to 31 March 2007 in the predecessor Councils, but not payable until 2007-2008.

The STFC Remuneration Committee determined the base pay of all such staff from April 2007, and from 2008 it will also determine annual performance related bonus payments, based on the achievement of both corporate and individual objectives.

Membership during 2007-2008 was:

Mr Philip Greenish, Chairman and Council Member

Mr Marshall Davies, Audit Committee Chairman and Council Member

Professor Keith Mason, Chief Executive

The Committee took account of the remuneration policy for senior civil servants, set by the Cabinet Office following independent advice from the Review Body on Senior Salaries (for further information about the Review Body on Senior Salaries see www.ome.uk.com).

In determining the base pay of senior staff in STFC, the Remuneration Committee also took account of:

- the staff member's individual performance;
- salary relativities with other Research Councils and other academic analogues; and
- the need to recruit, retain and motivate staff of an appropriate calibre to lead and manage STFC.

The CCLRC Remuneration Committee was chaired by Sir Graeme Davies; members were Mr Marshall Davies and Ms Anne Kensall, with Professor John Wood in attendance and Mr Paul Hartley as secretary. The Chair of the PPARC Remuneration Committee was Mr Colin Paynter; members were Professor John Inkson and Professor Keith Mason. Following the untimely death of Mr John Love, Administration Director of PPARC, Mr Paul Hartley also acted as secretary for this Committee. These two Committees, each of which met once in 2007-2008, operated in accordance with the terms of reference and criteria for determining bonus payments established in the two predecessor Councils.

CONTRACTS OF EMPLOYMENT

Council Chair and Members

Council Chair and Council Member appointments are Ministerial Appointments made by the Secretary of State for Innovation, Universities and Skills. The process for new appointments to the Council Chair and Council Members is conducted under the Code of the Commissioner for Public Appointments. This is available at www.ocpa.gov.uk. In accordance with the Code, vacancies are advertised nationally and a panel, including independent members, oversees the process. The panel reviews all applications, shortlists and interviews, and then makes a recommendation to the Secretary of State. Once the Secretary of State has made a final decision, an offer of appointment is issued by SRG on his behalf to the successful candidate.

Council Chair and Council Members are defined as Office Holders. They are neither employees nor civil servants. Appointments are made for three years initially with the possibility of reappointment for up to a further three years. Appointments are non-pensionable and there is no compensation for loss of office.

The composition of STFC Council, newly-created on 1 April 2008, was as follows:

Chairman

Mr Peter Warry FREng, Chairman of Victrex PLC and BSS Group PLC

Chief Executive

Professor Keith Mason

Members

Professor Keith Burnett CBE FRS, University of Sheffield

Mr Marshall Davies, Independent Advisor

Professor Michael Edmunds FRAS FinstP, University of Cardiff

Mr Philip Greenish CBE, Royal Academy of Engineering

Dr Philip Kaziewicz, GI Partners

Professor Anneila Sargent FRSA, California Institute of Technology

Professor Richard Wade, STFC

Professor Colin Whitehouse FREng, STFC

In order to deal with CCLRC and PPARC legacy issues, including responsibility for oversight of the respective annual reports and accounts for 2006-2007 there was some continuing membership of PPARC Council and CCLRC Council. Payments made in respect of this continuing membership are disclosed in note 23. Membership of PPARC Council ceased on 31 July 2007 while CCLRC Council remains formally intact, but with no paid members, until legacy issues are resolved.

Other Senior Employees

All appointments to permanent roles in STFC are made on the basis of merit and through fair and open competition. The Chief Executive allocates responsibilities to senior employees.

Unless otherwise stated below, the staff covered by this report hold appointments which are open-ended until they reach the normal retirement age of 65. As is the case with other STFC employees, the contract may be extended beyond age 65 by mutual agreement. Senior employees are required to give a notice period of three months.

Early termination of employment, other than for misconduct, would result in the individual receiving compensation as set out in STFC's Conditions of Employment Memoranda, which in this area enact the provisions of the Civil Service Compensation Scheme.

Remuneration of Council Members

The following information is subject to audit.

The Council comprises both senior management and external appointees. The remuneration of senior management is detailed below. The total cost of external Council appointments in the period was £60,666 and external Council appointees' remuneration excluding pension contributions was in the following ranges:

Range	2007-2008 Number	2006-2007* Number
£0 - £4,999	-	2
£5,000 - £9,999	6	24
£10,000 - £14,999	-	-
£15,000 - £19,999	1**	2
£20,000 - £24,999	-	1

*Comparative figures are for the two predecessor Councils combined.
**Council Chairman

The Council reimburses travel and subsistence expenses necessarily incurred by Council members attending meetings or undertaking other tasks arising from their membership, in accordance with the conditions and at the rates applying to the Council's employees. The amount reimbursed for 2007-2008 was £9,985 (2006-2007*: £19,857). Council members did not become members of a pension scheme and there were no superannuation payments relating to the fees paid to them.

Salary and pension entitlements of senior employees

The following sections provide details of the remuneration and pension interests of senior employees who were members of the STFC Executive Board during the year.

	Remuneration*	
	2007-2008 £'000	**2006-2007 £'000**
Professor Keith Mason	135-140	105-110
Mr Jeff Down	85-90	80-85
Mr Paul Hartley	80-85	75-80
Mr Jim Sadlier	85-90	80-85
Mr Gordon Stewart**	105-110	-
Dr Andrew Taylor	95-100	90-95
Dr Liz Towns-Andrews**	55-60	-
Professor Richard Wade	95-100	90-95
Professor Colin Whitehouse	85-90	80-85
Professor John Womersley**	75-80	-

Notes

a. *Remuneration includes any allowances and non-consolidated bonus but not employer's pension contribution.

b. ** Joined the Executive Board on 6 February 2008 following the establishment of three new seats on the Board. Full year equivalent remuneration as a Director is disclosed.

c. Bonuses paid in 2007-2008 relate to performance in 2006-2007 in the predecessor Councils. Bonuses for 2007-2008 performance have not yet been agreed by the Remuneration Committee.

d. The average earnings increase for senior employees was £4,130 (4.8%). This excludes the Chief Executive and those senior employees that joined the Board in February 2008.

e. Professor John Wood received remuneration for the period 1 April 2007 – 31 July 2007 within the £55,000 - £60,000 band. These costs are included in note 23.

Benefits in kind

The monetary value of benefits in kind covers any benefits provided by the employer and treated by the Inland Revenue as a taxable emolument. With the exception of Professor Mason, none of the above senior employees received such benefits in kind during 2007-2008.

Professor Mason received some assistance under the relocation terms within his letter of appointment. The assessed monetary value of this assistance for 2007-2008 was £2,502 (2006-2007: £2,000).

Pension Benefits

	Accrued pension at age 60 as at 31/3/08 and related lump sum	Real increase in pension and related lump sum at age 60	CETV at 31/3/08	CETV at 31/3/07	Real increase in CETV	Employer contribution to partnership pension account
	£'000	£'000	£'000	£'000	£'000	£
Professor Keith Mason	50 - 55 plus no lump sum	7.5 - 10 plus no lump sum	980	728*	148	-
Mr Jeff Down	35 - 40 plus 110 - 115 lump sum	0 - 2.5 plus 2.5 - 5 lump sum	936	806	29	-
Mr Paul Hartley	25 - 30 plus 60 - 65 lump sum	0 - 2.5 plus 0 - 2.5 lump sum	493	404	21	-
Mr Jim Sadlier	35 - 40 plus 105 - 110 lump sum	0 - 2.5 plus 2.5 - 5 lump sum	882	781	29	-
Mr Gordon Stewart	0 - 5 plus no lump sum	0 - 2.5 plus no lump sum	11	-	9	-
Dr Andrew Taylor	30 - 35 plus 100 - 105 lump sum	0 - 2.5 5 - 7.5 lump sum	614	562	41	-
Dr Liz Towns-Andrews	10 - 15 plus 30 - 35 lump sum	0 - 2.5 plus 0 - 2.5 lump sum	264	-	22	-
Professor Richard Wade	30 - 35 plus 90 - 95 lump sum	0 - 2.5 plus 2.5 - 5 lump sum	645	544	21	-
Professor Colin Whitehouse	5 - 10 plus no lump sum	0 - 2.5 plus no lump sum	132	94	23	-
Professor John Womersley	0 - 5 plus no lump sum	0 - 2.5 plus no lump sum	41	-	14	-

*Prior year published figure was incorrect.
See note 4 for details of the pension scheme.

Cash Equivalent Transfer Values

A Cash Equivalent Transfer Value (CETV) is the actuarially assessed capitalised value of the pension scheme benefits accrued by a member at a particular point in time. The benefits valued are the member's accrued benefits and any contingent spouse's pension payable from the scheme. A CETV is a payment made by a pension scheme or arrangement to secure pension benefits in another pension scheme or arrangement when the member leaves a scheme and chooses to transfer the benefits accrued in their former scheme. The pension figures shown relate to the benefits that the individual has accrued as a consequence of their total membership of the pension scheme, not just their service in a senior capacity to which disclosure applies.

The CETV figures and, from 2003-2004 the other pension details, include the value of any pension benefit in another scheme or arrangement which the individual has transferred to the Civil Service Pensions arrangements and for which the Civil Service Vote has received a transfer payment commensurate to the additional pension liabilities being assumed. They also include any additional pension benefit accrued to the member as a result of their purchasing additional years of pension service in the scheme at their own cost. CETVs are calculated within the guidelines and framework prescribed by the Institute and Faculty of Actuaries.

Real increase in CETV

This reflects the increase in CETV effectively funded by the employer. It does not include the increase in accrued pension due to inflation, contributions paid by the employee (including the value of any benefits transferred from another pension scheme or arrangement) and uses common market valuation factors for the start and end of the period.

Keith Mason
Accounting Officer

14 July 2008

Annual Accounts

STATEMENT OF THE RESPONSIBILITIES OF THE SCIENCE AND TECHNOLOGY FACILITIES COUNCIL AND OF ITS CHIEF EXECUTIVE

Under Section 2(2) of the Science and Technology Act 1965 the Council is required to prepare a statement of accounts for each financial year in the form and on the basis directed by the Secretary of State for Innovation, Universities and Skills with the consent of the Treasury. The accounts are prepared on an accruals basis and must show a true and fair view of the Council's state of affairs at the year end and of its income and expenditure, recognised gains and losses and cash flows for the financial year.

In preparing the accounts, the Accounting Officer is required to comply with the requirements of the Government Financial Reporting Manual and in particular to:

- observe the Accounts Direction issued by the Secretary of State for Innovation, Universities and Skills, including the relevant accounting and disclosure requirements, and apply suitable accounting policies on a consistent basis;
- make judgements and estimates on a reasonable basis;
- state whether applicable accounting standards as set out in the Government Financial Reporting Manual have been followed and disclose and explain any material departures in the financial statements; and
- prepare the financial statements on the going concern basis.

The Secretary of State for Innovation, Universities and Skills has designated the Chief Executive of the Science and Technology Facilities Council (STFC) as Accounting Officer of STFC. The responsibilities of an Accounting Officer, including responsibility for the propriety and regularity of the public finances for which the Accounting Officer is answerable, for the keeping of proper records and for safeguarding STFC's assets are set out in 'The Responsibilities of an NDPB Accounting Officer' issued by the Treasury and published in 'Managing Public Money'.

STATEMENT ON INTERNAL CONTROL

Scope of responsibilities

This is the first annual Statement on Internal Control for the Science and Technology Facilities Council (STFC) which was created on the 1 April 2007 on the merger of PPARC and CCLRC. As Accounting Officer, I have responsibility for maintaining a sound system of internal control that supports the achievement of policies, aims and objectives set by the STFC, whilst safeguarding the public funds and assets for which I am personally responsible. My responsibilities are assigned to me through my letter of appointment from the Accounting Officer of the Department for Innovation, Universities and Skills (DIUS) and is consistent with the principles set out in 'Managing Public Money'.

As Accounting Officer, I accept full responsibility for the identification, management and treatment of risk across STFC. I discharged that responsibility with the support of an Audit Committee; a sub-committee of Council that acts as the key support for assurance to the Accounting Officer. Audit Committee is tasked by the Accounting Officer / Council to:

- gain assurance that risk, and change in risk, is being monitored;
- receive the various assurances which are available about risk management and consequently delivering an overall opinion about risk management; and
- comment on the adequacy of risk management and internal control in STFC and on the appropriateness of assurance processes that are in place.

Procedures and controls were regularly considered by the Audit Committee, comprising Non-Executive Members and with me, the Finance Director, and representatives of both External and Internal Audit in attendance. The Committee met on five occasions during 2007-2008. The Committee undertakes a number of duties on behalf of the Council, the most notable of which is the full consideration of the Annual Accounts.

The purpose of the system of internal control

The system of internal control is designed to manage risk to a reasonable level rather than to eliminate it entirely. It can therefore only provide reasonable and not absolute assurance of effectiveness. The system of internal control at STFC is based on ongoing processes designed to identify and prioritise the principal risks to the achievement of the Council's policies, aims and objectives, to evaluate the likelihood and impact of those risks being realised and to manage them efficiently, effectively and economically. The system of internal control has been in place in the STFC for the year ended 31 March 2008 and up to the date of approval of the annual report and accounts, and accords with HM Treasury guidance.

Capacity to handle risk

Facilitating leading edge science and developing world-leading technology are the goals of the STFC and cannot be achieved without risks being taken. Where the potential scientific return is high STFC embraces risk. The identification, analysis and management of risk is therefore inherent in much of what STFC does. In areas such as financial management and health and safety however STFC's risk appetite is minimal.

STFC inherited risk processes from its predecessors and has sought during the year to embed a robust and unified risk assessment process within its programme/ project management framework and regular reports have been made to the Audit Committee, Project Oversight Committees and STFC operational committees through management reports, Traffic Light Reporting and other mechanisms. This risk management framework is evolving in the new body and further developments and improvements are planned. In particular, we will integrate fully risk management with performance management and strategic risk management with operational decision making.

The risk and control framework

STFC's risk management policy, established initially in July 2007 and updated in May 2008, is to:

a. manage risk effectively across the full breadth of the programme;

b. devolve responsibility for risk management to the most appropriate level and locality but with appropriate assurance and monitoring mechanisms;

c. integrate risk management with planning and budgeting to ensure that risk is taken fully into account in strategic investment decisions;

d. encourage a risk–aware, risk-enabled approach to working;

e. provide guidance and training on the tools and techniques for risk assessment and risk management; and

f. continuous improvement in risk management policies and good practices.

The management of risk is integral to policy making, planning and delivery through the awareness of staff at all levels, supported and encouraged by the Council, its Audit Committee and the Executive Board. An initial Risk Management Policy was approved Audit Committee in July 2007 and a revised policy approved by the Executive Board on 16 May 2008.

The assurance framework underpinning these roles is built on two types of assurances: assurance from management and from independent sources. There are important differences between the two.

- Management assurance: The primary responsibility for providing assurance on the adequacy of risk management and internal control rests with management. Management in STFC has put in place over the year the framework to ensure they have the necessary evidence to satisfy themselves as to the efficiency and effectiveness of the internal control framework and to provide the required level of assurance to the Executive Board and subsequently, Council via the Audit Committee. This internal management assurance will be quality assured by review from Internal Audit in August 2008. The assurance includes:
  - specific assurance statements from each senior director (Stewardship Reports);
  - Ongoing development of risk management and a periodic review of the risk register by a Risk Advisory Group chaired by the Director of Corporate and Commercial Affairs; and
  - ongoing internal reporting/oversight activities through the management/ committee structure, e.g. Safety, Health and Environment (SHE) reviews.
- Independent Assurance: Independent assurance validates management assurance. This is primarily provided by the Research Councils' Internal Audit Service (RCIAS).

Review of effectiveness

As Accounting Officer, I also had responsibility for reviewing the effectiveness of the system of internal control at STFC. My review of the effectiveness of the system of internal control was informed by the two part assurance framework defined above.

Management assurance

I was advised on the implications of the results of my review of the effectiveness of the system of internal control by the Executive Board and the Audit Committee, and the stewardship returns provided by senior directors.

This assurance is underpinned by regular management information, sound administrative procedures, which included the segregation of duties, and a system of delegation and accountability from me to senior Directors incorporated into a Stewardship Framework. Particular strengths of the system of internal control were seen as:

- comprehensive budgeting systems reviewed and agreed by the Finance Committee;
- routine oversight by Resource Committees, the Audit Committee, Finance Committee and Council of financial reports, which measured financial performance as well as rolling outturn forecasts, cash flow projections and risks; and
- formal project management disciplines, to International Standards, covering both capital spend and STFC's involvement in significant joint working initiatives with other scientific organisations.

Independent sssurance

STFC has received a positive reasonable assurance from the RCIAS. The key themes raised by RCIAS are consistent with the outcomes of the management assurance framework.

Significant issues

The assurance process enables management to take an all-encompassing view of the entire risk and control framework and to rely on the assurances received. This has been the first year of STFC operations post merger of PPARC and CCLRC. Within the overall assurance framework there are common themes that require attention including: communication, strategic planning, stakeholder engagement and the need to finalise the harmonisation of administrative policies and procedures post merger. In addition, STFC still currently operates two separate finance systems which are consolidated for accounting purposes and ex-PPARC and ex-CCLRC policy and procedural guidance remains extant. I recognise the critical to need ensure that STFC operates as one organisation going forward, including the need to ensure uniform requirements, policies and practices.

A notable concern relates to the impact on routine operations of Shared Services Centre (SSC). The SSC implementation project will deliver a single administrative support service for all UK Research Councils. Initially the SSC will provide HR, Finance, Procurement and IS services, however in the longer term it is also planned to add Grants Processing. This project is business critical for STFC as it fundamentally changes the way back-office services are provided effectively through outsourcing them to the new SSC organisation. The project operates across all seven Councils and is directed by a Project Board comprised of representatives of each Council, the

SSC itself and a number of independent members. The Board is chaired by the Chair of the RCUK Executive Group. The principal risks for the Project, and therefore for the seven Councils, are the potential for cost and time overruns and these are a clear focus for the Project Board. The STFC target date for migration has been rescheduled to September 2009.

As a stakeholder in the project STFC has its own Group who manages its participation and associated risks in the project. The high level risks and mitigation strategies are regularly scrutinised by Audit Committee.

In addition an enforcement notice was issued by the Environment Agency (EA). The EA inspector was not satisfied with aspects of documentation and management systems of radioactive materials in general and an enforcement notice was issued in March 2008. This reflected a minor breach with no risk of pollution or to health. An STFC project has been established to resource and address issues raised.

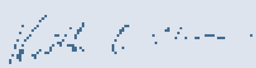
STFC recognises the material challenges it is facing and the necessary changes to processes, procedures and operations commenced during the year. Significant reorganisations have taken place and further improvements and developments are planned. A series of reviews were conducted to inform this process going forward. Key areas of continuous improvement going forward include:

- the development and implementation of a new corporate strategy, including a clear focus on mission, vision and values;
- a joined up operational planning framework aligned to strategic objectives;
- a coherent performance management framework for monitoring/measuring performance;
- an integrated performance and risk management framework;
- improved stakeholder engagement and external communications; and
- a more systematic approach to internal communication, including the communication of comprehensive and definitive policies and procedures in our key operational/ decision making systems.

Summary

It is acknowledged by me, Council and senior staff that the aforementioned issues reflect a challenging period in STFC's first year of existence. Nevertheless, it is reassuring to note that while such difficulties impacted on operations the underpinning scientific control environment continued to operate effectively, and the financial and administrative control environment was materially sound.
I remain particularly positive on the quality of control that continues to deliver world class science, technology and facilities.

I am confident however that the changes made to date and improvement plans going forward enables the Science and Technology Facilities Council to continue to operate on a sound basis.



Keith Mason
Accounting Officer

14 July 2008

THE CERTIFICATE AND REPORT OF THE COMPTROLLER AND AUDITOR GENERAL TO THE HOUSES OF PARLIAMENT

I certify that I have audited the financial statements of the Science and Technology Facilities Council for the year ended 31st March 2008 under the Science and Technology Act 1965. These comprise the Consolidated Statement of Net Expenditure, the Consolidated Balance Sheet, the Council's Balance Sheet, the Consolidated Cash Flow Statement, the Consolidated Statement of Recognised Gains and Losses and the related notes. These financial statements have been prepared under the accounting policies set out within them. I have also audited the information in the Remuneration Report that is described in that report as having been audited.

Respective responsibilities of the Council, Chief Executive and Auditor

The Council and Chief Executive as Accounting Officer are responsible for preparing the Annual Report, the Remuneration Report and the financial statements in accordance with the Science and Technology Act 1965 and Secretary of State for Innovation, Universities and Skills directions made thereunder and for ensuring the regularity of financial transactions. These responsibilities are set out in the Statement of Council and Chief Executive's Responsibilities.

My responsibility is to audit the financial statements and the part of the remuneration report to be audited in accordance with relevant legal and regulatory requirements, and with International Standards on Auditing (UK and Ireland).

I report to you my opinion as to whether the financial statements give a true and fair view and whether the financial statements and the part of the Remuneration Report to be audited have been properly prepared in accordance with the Science and Technology Act 1965 and Secretary of State for the Department of Innovation, Universities and Skills directions made thereunder. I report to you whether, in my opinion, the information which comprises the Statutory Basis of the Council and Management commentary included within the Annual Report is consistent with the financial statements. I also report whether in all material respects the expenditure and income have been applied to the purposes intended by Parliament and the financial transactions conform to the authorities which govern them.

In addition, I report to you if the Science and Technology Facilities Council has not kept proper accounting records, if I have not received all the information and explanations I require for my audit, or if information specified by HM Treasury regarding remuneration and other transactions is not disclosed.

I review whether the Statement on Internal control reflects the Science and Technology Facilities Council's compliance with HM Treasury's guidance, and I report if it does not. I am not required to consider whether this statement covers all risks and controls, or form an opinion on the effectiveness of the Science and Technology Facilities Council's corporate governance procedures or its risk and control procedures.

I read the other information contained in the Annual Report and consider whether it is consistent with the audited financial statements. I consider the implications for my report if I become aware of any apparent misstatements or material inconsistencies with the financial statements. My responsibilities do not extend to any other information.

Basis of audit opinions

I conducted my audit in accordance with International Standards on Auditing (UK and Ireland) issued by the Auditing Practices Board. My audit includes examination, on a test basis, of evidence relevant to the amounts, disclosures and regularity of financial transactions included in the financial statements and the part of the Remuneration Report to be audited. It also includes an assessment of the significant estimates and judgments made by the Council and Chief Executive in the preparation of the financial statements, and of whether the accounting policies are most appropriate to the Science and Technology Facilities Council's circumstances, consistently applied and adequately disclosed.

I planned and performed my audit so as to obtain all the information and explanations which I considered necessary in order to provide me with sufficient evidence to give reasonable assurance that the financial statements and the part of the Remuneration Report to be audited are free from material misstatement, whether caused by fraud or error, and that in all material respects the expenditure and income have been applied to the purposes intended by Parliament and the financial transactions conform to the authorities which govern them. In forming my opinion I also evaluated the overall adequacy of the presentation of information in the financial statements and the part of the Remuneration Report to be audited.

Opinions

Audit Opinion

In my opinion:

- the financial statements give a true and fair view, in accordance with the Science and Technology Act 1965 and directions made thereunder by Secretary of State for the Department of Innovation, Universities and Skills, of the state of the Science and Technology Facilities Council's affairs and its consolidated affairs as at 31 March 2008 and its net expenditure for the year then ended;
- the financial statements and the part of the Remuneration Report to be audited have been properly prepared in accordance with the Science and Technology Act 1965 and the Secretary of State for the Department of Innovation, Universities and Skills directions made thereunder; and
- information which comprises the Statutory Basis of the Council and Management commentary included within the Annual Report is consistent with the financial statements.

Opinion on Regularity

In my opinion, in all material respects the expenditure and income have been applied to the purposes intended by Parliament and the financial transactions conform to the authorities which govern them.

Report

I have no observations to make on these financial statements.

T J Burr
Comptroller and Auditor General
National Audit Office
151 Buckingham Palace Road
Victoria
London
SWIW 9SS

17 July 2008

CONSOLIDATED STATEMENT OF NET EXPENDITURE
FOR THE YEAR ENDED 31 MARCH 2008

	Notes	STFC Group 2007-2008 £'000	Interest in DLSL Joint Venture 2007-2008 £'000	Consolidated Total 2007-2008 £'000	Consolidated Total 2006-2007 Restated* £'000
Income					
Income from operating activities	2	56,668	21,130	77,798	51,580
Total income		56,668	21,130	77,798	51,580
Expenditure					
Staff costs	4	82,251	10,534	92,785	79,113
Restructuring	5	2,825	-	2,825	1,864
Research grants	6	96,875	-	96,875	77,813
Other grants and awards	7	28,624	-	28,624	33,541
International subscriptions	8	185,025	-	185,025	177,320
Equipment and supplies		29,815	520	30,335	33,756
Services		39,841	5,313	45,154	34,705
Depreciation	10	47,763	14,343	62,106	37,498
Fixed asset impairments	10	1,972	-	1,972	883
Joint venture funding		24,985	-	24,985	-
Notional cost of capital		26,327	-	26,327	24,394
Other operating costs	9	15,374	5,184	20,558	25,655
Write down of investment in DLSL	12	13,385	(13,385)	-	-
Total expenditure		595,062	22,509	617,571	526,542
Net operating costs		(538,394)	(1,379)	(539,773)	(474,962)
Interest	3	46	712	758	669
Unwinding of discount on provisions	15	(362)	(443)	(805)	(944)
Net operating costs before tax		(538,710)	(1,110)	(539,820)	(475,237)
Tax on operating activities		-	(214)	(214)	(215)
Net operating costs after tax		(538,710)	(1,324)	(540,034)	(475,452)
Profit on sale of investment		-	-	-	75
Loss on disposal of assets		(261)	-	(261)	(751)
Net expenditure for the year		(538,971)	(1,324)	(540,295)	(476,128)
Reversal of cost of capital		26,327	-	26,327	24,394
Net expenditure for the year after reversal of cost of capital		(512,644)	(1,324)	(513,968)	(451,734)

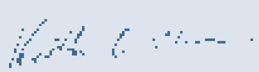
All activities are continuing.

The notes on pages 111 to 132 form part of these accounts.

*The STFC was created on 1 April 2007 following the merger of the Council for the Central Laboratory of the Research Councils and the Particle Physics and Astronomy Research Council. The results from the CCLRC and PPARC 2006-2007 accounts have been consolidated and all intra group transactions have been eliminated.

CONSOLIDATED BALANCE SHEET
AS AT 31 MARCH 2008

	Notes	STFC Group 31/03/08 £'000	Interest in DLSL Joint Venture 31/03/08 £'000	Consolidated Total 31/03/08 £'000	Consolidated Total 31/03/07 Restated* £'000
Fixed assets					
Tangible assets	10	553,798	303,450	857,248	840,991
Investments	11	61	-	61	136
Investment in joint venture	12	271,985	(271,985)	-	-
		825,844	**31,465**	**857,309**	**841,127**
Current assets					
Stocks		24	-	24	86
Debtors and prepayments					
- amounts falling due after one year	13	4,485	-	4,485	3,581
- amounts falling due within one year	13	47,539	1,253	48,792	41,319
Cash at bank and in hand	18	30,765	16,720	47,485	36,949
		82,813	**17,973**	**100,786**	**81,935**
Creditors					
Amounts falling due within one year	14	(88,044)	(13,804)	(101,848)	(77,638)
Net current (liabilities)/assets		**(5,231)**	**4,169**	**(1,062)**	**4,297**
Total assets less current liabilities		**820,613**	**35,634**	**856,247**	**845,424**
Accrued liabilities and charges					
Creditors (amounts falling due after more than one year)	14	(9,514)	(24,433)	(33,947)	(33,159)
Provisions	15	(34,771)	(11,201)	(45,972)	(55,558)
Total assets less liabilities		**776,328**	**-**	**776,328**	**756,707**
Financed by:					
Capital and Reserves					
Revaluation reserve	16	136,547	-	136,547	177,006
Income and expenditure reserve	16	639,781	-	639,781	579,701
Government funds		**776,328**	**-**	**776,328**	**756,707**



Keith Mason
Accounting Officer

14 July 2008

The notes on pages 111 to 132 form part of these accounts

*The STFC was created on 1 April 2007 following the merger of the Council for the Central Laboratory of the Research Councils and the Particle Physics and Astronomy Research Council. The results from the CCLRC and PPARC 2006-2007 accounts have been consolidated and all intra group transactions have been eliminated.

STFC BALANCE SHEET
AS AT 31 MARCH 2008

	Notes	31/03/08 £'000	31/03/07 Restated* £'000
Fixed assets			
Tangible assets	10	553,798	555,956
Investment in joint venture	12	271,985	255,605
		825,783	**811,561**
Current assets			
Stocks		24	86
Debtors and prepayments			
- amounts falling due after one year	13	4,485	3,581
- amounts falling due within one year	13	47,156	40,669
Cash at bank and in hand	18	30,447	20,246
		82,112	**64,582**
Creditors			
Amounts falling due within one year	14	(86,147)	(69,562)
Net current (liabilities)/assets		**(4,035)**	**(4,980)**
Total assets less current liabilities		**821,748**	**806,581**
Accrued liabilities and charges			
Creditors (amounts falling due after more than one year)	14	(9,514)	(5,559)
Provisions	15	(34,771)	(44,827)
Total assets less liabilities		**777,463**	**756,195**
Financed by:			
Capital and Reserves			
Revaluation reserve	16	136,486	176,871
Income and expenditure reserve	16	640,977	579,324
Government funds		**777,463**	**756,195**

Keith Mason
Accounting Officer

14 July 2008

The notes on pages 111 to 132 form part of these accounts

*The STFC was created on 1 April 2007 following the merger of the Council for the Central Laboratory of the Research Councils and the Particle Physics and Astronomy Research Council. The results from the CCLRC and PPARC 2006-2007 accounts have been consolidated and all intra group transactions have been eliminated.

CONSOLIDATED CASH FLOW STATEMENT
FOR THE PERIOD ENDED 31 MARCH 2008

	Notes	2008 £'000	2007 Restated* £'000
Net cash (outflow) from operating activities	17	(449,878)	(401,639)
Returns on investment and servicing of finance			
Interest	3	46	(48)
Net proceeds on sale of investment		-	75
Capital expenditure			
Payments to acquire tangible fixed assets		(78,547)	(75,746)
Cash proceeds from disposal of fixed assets		3,357	577
Payments to acquire investment in joint venture		(29,765)	(51,886)
Financing			
Grant in aid		558,749	527,601
Other capital funding		3,880	4,553
Grant from Joint Infrastructure Fund (JIF)		138	107
Funding from international partners		1,625	4,131
Increase/(decrease) in cash		**9,605**	**7,725**
Reconciliation of net cash flow to movement in net funds			
Increase/(decrease) in cash in the period	18	9,605	7,725
Change in net funds			
Net funds at 1 April		21,160	13,435
Net funds at 31 March		**30,765**	**21,160**

*In accordance with FRS 9, cash flows between STFC and DLSL are included under the appropriate heading, but other Diamond cash flows are excluded.

CONSOLIDATED STATEMENT OF RECOGNISED GAINS AND LOSSES
FOR THE YEAR ENDED 31 MARCH 2008

	STFC Group 2007-2008 £'000	Interest in DLSL Joint Venture 2007-2008 £'000	Consolidated Total 2007-2008 £'000	Consolidated Total 2006-2007 Restated* £'000
Net surplus on revaluation of fixed assets	(30,807)	-	(30,807)	51,100
Recognised gains/(losses) for the year	**(30,807)**	**-**	**(30,807)**	**51,100**

The notes on pages 111 to 132 form part of these accounts

*The STFC was created on 1 April 2007 following the merger of the Council for the Central Laboratory of the Research Councils and the Particle Physics and Astronomy Research Council. The results from the CCLRC and PPARC 2006-2007 accounts have been consolidated and all intra group transactions have been eliminated.

NOTES TO THE ACCOUNTS

1. ACCOUNTING POLICIES

1.1 Basis of accounting

The accounts have been prepared in accordance with a Direction issued by the Secretary of State for Innovation, Universities and Skills in pursuance of Section 2(2) of the Science and Technology Act 1965.

The accounts have been prepared under the historical cost convention, modified to include the revaluation of fixed assets. Without limiting the information given, the accounts meet the accounting and disclosure requirements of the Companies Act 1985 and the accounting and financial reporting standards issued or adopted by the Accounting Standards Board as interpreted for Government use by the Financial Reporting Manual (FReM) and in so far as these requirements are appropriate. The accounting policies have been applied consistently in dealing with items considered material in relation to the accounts.

The STFC was created on 1 April 2007 following the merger of the Council for the Central Laboratory of the Research Councils (CCLRC) and the Particle Physics and Astronomy Research Council (PPARC). The accounts for STFC have been prepared in accordance with the principles of merger accounting as required under Financial Reporting Standard 6 as interpreted for Government use by the FReM. Comparative figures are reflected as though STFC had been in operation from 1 April 2007 and comprise figures for the former CCLRC and PPARC with all intra group transactions eliminated on consolidation.

1.2 Basis of consolidation

Interests in subsidiary undertakings and joint ventures are accounted for in accordance with Financial Reporting Standards 2 and 9 respectively. The STFC group comprises STFC and CLIK.

The Council holds the majority shareholding in the joint venture company Diamond Light Source Limited (DLSL). Under the terms of the joint venture agreement, control is shared jointly with the minority shareholder, the Wellcome Trust. The results of DLSL Limited are therefore accounted for as a joint venture rather than a subsidiary.

1.3 Fixed assets

Land and buildings are included in the balance sheet at open market value for existing use, or depreciated replacement cost in the case of specialised buildings. Professional valuations are obtained every five years and are revised in the intervening years by use of appropriate indices. Polaris House is owned jointly by a number of the Research Councils and is professionally revalued every four years and modified in the intervening years by the use of appropriate indices.

Items of plant and equipment costing over £3,000 are included at current replacement cost less an allowance for depreciation. Professional valuations are obtained every five years and are revised in the intervening years by use of appropriate indices. Indexation was not applied in 2007-2008 as the movement in value was immaterial.

Assets under construction are valued at cost, including directly attributable in house costs required to bring the asset into working condition for its intended use. In view of the STFC's primary objective to construct large research facilities, in-house costs will also include certain overheads that are deemed directly attributable to the cost of the asset. Abnormal costs are not capitalised. Once brought into use, any variation between the actual value of the asset and the carrying value of the asset under construction is adjusted through the Statement of Net Expenditure.

Surpluses or deficits on revaluation are taken to the revaluation reserve except that any permanent diminution in value is charged to the Statement of Net Expenditure when recognised. The realised element is transferred to the Statement of Net Expenditure.

1.4 Depreciation

Freehold land is not depreciated. Depreciation is charged on all other tangible fixed assets at rates calculated to write down the valuation of each asset to its estimated residual value evenly over its expected useful life. Average estimated useful lives are as follows:

Freehold buildings	60 years
Long leasehold properties	60 years or term of lease
Other leased assets, including dwellings	Term of lease
Plant and machinery	20 years
Scientific equipment	15 years
Electronic scientific equipment	10 years
Computers and information technology	5 years
Vehicles	4 years
Personal computers	3 years

Fixed assets are depreciated as soon as they are brought into use. A full month's depreciation is charged in the month they are brought into use and none in the month of disposal. Assets under construction are not depreciated until they are brought into use.

1.5 Ownership of equipment purchased with STFC research grants

Through the Conditions of Grant applied to funded institutions, STFC reserves the right to determine how equipment purchased by an institution with research grant funds is disposed of, and how any disposal proceeds are to be utilized during the period of the research. Once the research has been completed the institution is free to use such equipment without reference to STFC. Such equipment is excluded from these financial statements.

1.6 Stocks and long term contract balances

Stocks are valued at the lower of current replacement cost and net realisable value.

Long term contracts, comprising individual pieces of research undertaken for private companies, are valued at the lower of cost, including appropriate overheads, and net realisable value. Full provision is made for all known and expected losses to completion immediately such losses are forecast on each contract.

1.7 Financing

Grant in Aid is provided by the Department for Innovation Universities and Skills (DIUS) and is credited to the income and expenditure reserve when the cash is received.

All other sources of financing are credited to the income and expenditure reserve when the cash is received.

1.8 Income from operating activities

Amounts due annually from other Research Councils under general service level agreements are credited to the Statement of Net Expenditure when due. Income received in advance is treated as a creditor.

Grants receivable for specific research projects from other Research Councils, higher education institutions, government departments and the European Commission are credited to the Statement of Net Expenditure when due. Income received in advance is treated as a creditor.

Amounts receivable from the European Commission and foreign governments for general or specific use of the Council's research facilities are credited to the Statement of Net Expenditure when due under the terms of the agreement or when specific use is made of the facilities as appropriate. Income received in advance is treated as a creditor.

For all of the above sources of income, amounts applied to the purchase of fixed assets are credited to the income and expenditure reserve and released to the Statement of Net Expenditure over the working lives of the assets concerned.

For construction or design contracts with companies and other organisations, income is calculated as the value of work carried out during the year, including amounts not invoiced.

1.9 Research and development

The Council's expenditure on research and development is charged to the Statement of Net Expenditure when incurred.

1.10 Contributions to international collaboration projects

Contributions to international collaboration projects, where STFC does not have ownership of technical facilities, have been charged to the Statement of Net Expenditure in the period to which they relate.

1.11 Research grants

The majority of research grants are paid by STFC on an instalment basis in accordance with an agreed payment profile. Where the profile indicates an unclaimed and/or unpaid amount exists at the balance sheet date, such sums are accrued in the accounts. Future commitments at the balance sheet date are disclosed in the accounts.

The majority of studentship payments are paid on an installment basis in advance. Stipends are paid directly to the student on a quarterly basis and fee payments are made in two equal payments to the institutions.

1.12 Decommissioning costs

Decommissioning costs are recognised in full as soon as the obligation exists i.e. when the technical facility has been commissioned. An asset is set up with depreciation being charged to the Statement of Net Expenditure over its estimated useful life.

A provision is established, representing the current value of the expected future costs of decommissioning the Council's technical facilities and the interest due is charged to the Statement of Net Expenditure over the estimated working lives of the related assets and credited to a provision for liabilities and charges.

1.13 Pensions

Contributions to the United Kingdom Atomic Energy Authority (UKAEA) Pension Scheme and the Research Councils Pension Scheme are charged to the Statement of Net Expenditure in accordance with actuarial recommendations so as to spread the cost of the pensions over the employees' expected working lives.

Liability for the payment of future benefits is a charge on the UKAEA Pension Scheme and the Research Councils Pension Scheme and are consequently not included in these accounts.

1.14 Early departure costs

The costs of early retirement or severance are charged to the Statement of Net Expenditure when the early departures are agreed. These costs are net of the lump sums recoverable from the pension schemes when the individual reaches normal retirement age.

1.15 Closure and restructuring costs

Where a constructive obligation is made to terminate or radically change one of STFC's operational facilities or to restructure, a provision is set up to cover the direct costs associated with closure or restructuring in accordance with FRS12. Provisions have been established in the financial statements to cover the estimated costs associated with:-

- the closure of the Royal Greenwich Observatory site in Cambridge;
- the closure of the Synchrotron Radiation Source at Daresbury Laboratory;
- the ground based astronomy restructuring programme of the Joint Astronomy Centre in Hawaii and the Isaac Newton Group in La Palma;
- restructuring at the Astronomy Technology Centre in Edinburgh; and
- restructuring at the Rutherford Appleton Laboratory, Chilton and the Daresbury Laboratory in Cheshire.

1.16 Value Added Tax

The Council is registered for VAT jointly with six other Research Councils. Expenditure and fixed asset additions are stated net of recoverable VAT. Irrecoverable VAT is charged to the most appropriate expenditure or fixed asset heading. Non-attributable VAT recovered through the group arrangement is credited to income when received.

1.17 Foreign currency

Transactions denominated in foreign currency are translated at the rate of exchange ruling on the date of the transaction unless covered by a forward contract. Assets and liabilities denominated in foreign currency are translated at the rate of exchange ruling at the balance sheet date.

Transaction and translation gains and losses are credited or charged to the Statement of Net Expenditure.

1.18 Insurance

As a public body, the Council does not generally insure. However, the Council has decided, with the agreement of the DIUS, that risks relating to certain commercial contracts entered into by the Council should be commercially insured. Insurance premiums are charged to the Statement of Net Expenditure.

1.19 Notional cost of capital

A capital charge reflecting the cost of capital employed is calculated at 3.5% of average net assets employed during the year and included in operating costs. In accordance with Treasury guidance the notional charge is credited back to the Statement of Net Expenditure before taking the result for the year to the general reserve.

2. INCOME FROM OPERATING ACTIVITIES

	STFC Group 2007-2008 £'000	Interest in DLSL Joint Venture 2007-2008 £'000	Consolidated Total 2007-2008 £'000	Consolidated Total 2006-2007 Restated* £'000
UK Research Councils				
Arts and Humanities Research Council	167	-	167	149
Biotechnology and Biological Sciences Research Council	1,807	-	1,807	1,623
Economic and Social Research Council	615	-	615	519
Engineering and Physical Sciences Research Council	10,364	-	10,364	11,725
Medical Research Council	9	-	9	(24)
Natural Environment Research Council	4,432	-	4,432	4,065
	17,394	-	**17,394**	**18,057**
Government organisations				
Department for Innovation, Universities and Skills	1,028	19,445	20,473	630
Other	3,704	-	3,704	2,276
	4,732	**19,445**	**24,177**	**2,906**
External bodies				
HEIs	7,425	-	7,425	6,832
European Commission	5,798	-	5,798	5,693
Other overseas	13,607	-	13,607	11,346
Private sector	5,613	1,685	7,298	4,338
Domestic	2,099	-	2,099	2,408
	34,542	**1,685**	**36,227**	**30,617**
Total	**56,668**	**21,130**	**77,798**	**51,580**

*Operating income includes amounts received from EC and other bodies for asset construction/repayment work and access to facilities. Facilities are offered to EU users, commercial users and external users. Users are charged a unit cost based on direct operating costs and annual quantity of access with an allowance for overheads.

3. INTEREST

	STFC Group 2007-2008 £'000	Interest in DLSL Joint Venture 2007-2008 £'000	Consolidated Total 2007-2008 £'000	Consolidated Total 2006-2007 Restated £'000
Interest receivable	325	715	1,040	866
Amount payable to the consolidated fund	(96)	-	(96)	(10)
Less interest payable	-	(1)	(1)	-
Less foreign exchange (losses)/gains	(183)	(2)	(185)	(187)
	46	**712**	**758**	**669**

4. STAFFING

(See also the Remuneration Report on pages 96 to 100.)

Staff Costs

	STFC Group 2007-2008 £'000	Interest in DLSL Joint Venture 2007-2008 £'000	Consolidated Total 2007-2008 £'000	Consolidated Total 2006-2007 Restated £'000
Salaries and wages	70,365	10,308	80,673	68,001
Social security costs	5,837	2,063	7,900	5,725
Superannuation	13,689	827	14,516	13,206
Total payroll costs	**89,891**	**13,198**	**103,089**	**86,932**
Capitalised pay costs*	(7,640)	(2,664)	(10,304)	(7,819)
Staff costs charged to the income and expenditure account	**82,251**	**10,534**	**92,785**	**79,113**

Included in salaries and wages is an amount of £0.7 million (2006-2007: £1.2 million) in respect of agency staff.

*The capitalised pay costs are accounted for in the group balance sheet as part of assets under construction (note 10).

Superannuation

The employees of the Council are members of either the Principal Non-Industrial Superannuation Scheme of the United Kingdom Atomic Energy Authority (the PNISS) or the Research Councils' Pensions Scheme (the RCPS).

The PNISS is a notionally funded, contributory scheme. Employees who are members of the PNISS make pensions contributions at the rate of 7.5% of pensionable pay. The Council makes employer's contributions at a rate determined from time to time after actuarial assessment of assets and liabilities. In 2007-2008 the employer's contributions was 15.8% of pensionable pay.

The PNISS is a defined benefit scheme and a separate PNISS Scheme account is produced by the United Kingdom Atomic Energy Authority that recognises the scheme liability in accordance with FRS 17 as interpreted by FRAB for use in the public sector.

The RCPS is in all respects 'by-analogy' with the Principal Civil Service Pension Scheme, except that the employer's contribution is determined separately on the recommendation of the GAD. It is a notionally funded, contributory, defined benefit scheme, and is administered by the Research Councils' Joint Superannuation Services. The Scheme's accounts are prepared by the Biotechnology and Biological Sciences Research Council (BBSRC) on behalf of the Chief Executive of BBSRC as Accounting Officer for the RCPS, and contain the further disclosure information required under FRS17 as interpreted by FRAB for use in the public sector. The employer's contribution is agreed by the RCPS Board of Management on the recommendation of the GAD and in 2007-2008 was 21.3% of pensionable pay.

Both the PNISS and RCPS Schemes are multi-employer schemes and the Council is unable to identify its share of the underlying assets and liabilities.

There was one retirement on ill-health grounds during the year.

At 31 March 2008, 71 employees were PNISS members and 1,912 employees were RCPS members.

Staff Numbers

The Council counts the number of staff in post to include all permanent, fixed term and temporary staff of all types who are paid as employees through the payroll. On this basis the average number of whole-time equivalent persons (including senior management) employed during the year was 2,097 (2006-2007: 2,077). The average number of agency staff (whole-time equivalents) employed during the year was 10 (2006-2007: 17).

5. RESTRUCTURING COSTS

During the year 88 staff members left on early retirement or voluntary early severance terms. The total costs of these early departures together with redundancy costs associated with 2 other staff members whose fixed term appointments ended, and any additional costs arising from an underestimate of continuing annual payments for those who were granted early retirement prior to 31 March 2007, amounted to £13.1 million. Of this £4.1 million has been charged to the restructuring and SR provisions (see note 15). The balance of £9 million has been charged to the Statement of Net Expenditure and offset by a net decrease in restructuring provisions of £6.1 million.

6. RESEARCH GRANTS

	2008 £'000	2007 Restated £'000
Astronomy	50,032	42,873
Particle Physics	36,476	26,663
Nuclear Physics*	5,410	-
e-Science	3,910	7,029
Industrial Programme Support System (PIPSS)	966	1,122
Joint Infrastructure Fund (JIF)	81	126
	96,875	77,813

*Gross expenditure on Research Grants includes £5.276 million (2006-2007: £5.126 million) for nuclear physics grants. Prior to 1 April 2007 these were awarded by, and accounted for, by EPSRC.

7. OTHER GRANTS AND AWARDS

	2008 £'000	2007 Restated £'000
Research and Research Support	6,801	16,121
Postgraguate Training Awards, Fellowships	21,823	17,420
	28,624	33,541

8. INTERNATIONAL COLLABORATION AGREEMENTS

Amounts payable under subscription agreements	2008 £'000	2007 Restated £'000
European Incoherent Scatter Facility (EISCAT)	320	461
Anglo-Australian Telescope (AAT)	496	942
European Space Agency (ESA)	67,088	59,170
European Organisation for Nuclear Research (CERN)	77,835	78,301
European Science Foundation (ESF)	104	89
European Southern Observatory (ESO)	19,437	18,130
Institut Laue Langevin (ILL)	12,719	13,238
European Synchrotron Radiation Facility (ESRF)	7,026	6,984
Fermi Lab	-	5
	185,025	177,320

The STFC research objectives are shared with other major scientific nations and as such the Council collaborates with other nations in order to mitigate the high capital costs of facilities. Various agreements are in place to regulate annual contributions and the management of the various facilities. These include a period of notice of withdrawal from each arrangement. Of the most significant arrangements, CERN and ESA require notice periods of 12 months after the end of the current calendar year. On behalf of the UK, STFC joined ESO on 1 July 2002. ESO requires a notice period of 12 months with effect from 1 July 2013.

In the case of ESRF and ILL the UK has signed up to International Conventions which are periodically reviewed. The current ESRF Convention runs until the end of 2013 and has a notice period of 3 years. For ILL the 4th protocol of the Intergovernmental Convention was signed at the end 2002 and will remain in force until 31 December 2013. Thereafter it shall be tacitly extended from year to year unless any of the Governments gives written notification to the other Governments of its intention to withdraw from the Convention. Any such withdrawal will take effect upon the expiry of two years from the date of receipt of the notification by any of the other Governments or on such later date as may be specified in the notification.

Whilst the above collaborations are regulated by agreement, the political nature of the arrangements is such that any withdrawal would be on a negotiated basis at government level. Council has no current intentions to withdraw from these arrangements and in all cases would wish to honour research commitments made.

In the above arrangements, the facilities are not owned by STFC. Additionally, STFC collaborates with Dutch and Canadian partners in respect of the James Clerk Maxwell Telescope, Hawaii, and with Dutch partners in respect of the operation of telescopes on La Palma. The James Clerk Maxwell and La Palma telescopes are owned by STFC.

9. OTHER OPERATING COSTS

	STFC Group 2007-2008 £'000	Interest in DLSL Joint Venture 2007-2008 £'000	Consolidated Total 2007-2008 £'000	Consolidated Total 2006-2007 Restated £'000
Travel, subsistence and allowances	8,932	-	8,932	8,714
Utilities	6,451	-	6,451	6,789
Rent, rates and maintenance*	(593)	-	(593)	9,042
Decommissioning costs	(151)	-	(151)	(1,000)
Administration expenses	104	5,155	5,259	1,633
Auditors remuneration**	123	29	152	135
Increase in bad debt provision	265	-	265	-
Insurance premiums	243	-	243	342
Total	**15,374**	**5,184**	**20,558**	**25,655**

*Includes a rent rebate of £6.6 million from Vale of the White Horse District Council.

**The £123,000 is made up of STFC audit fee £115,000, ILL audit fee £2,000 and CLIK audit fee £6,000.

10. TANGIBLE FIXED ASSETS

	Freehold land and buildings £'000	Leasehold land and buildings £'000	Plant and equipment £'000	Assets under construction £'000	STFC Group Total £'000	Interest in DLSL Joint Venture £'000	Consolidated Total £'000
Cost or valuation							
At 1 April 2007	226,624	76,284	622,370	149,630	1,074,908	285,035	1,359,943
Additions	562	-	13,506	67,388	81,456	32,764	114,220
Reclassification	1,994	-	10,262	(12,256)	-	-	-
Disposals	(3,270)	(40)	(2,652)	212	(5,750)	(55)	(5,805)
Impairments	(3)	(632)	-	-	(635)	-	(635)
Revaluation	6,774	7,903	245	-	14,922	-	14,922
At 31 March 2008	**232,681**	**83,515**	**643,731**	**204,974**	**1,164,901**	**317,744**	**1,482,645**
Depreciation							
At 1 April 2007	7,912	55,514	455,526	-	518,952	-	518,952
Charged in year	5,771	3,529	38,463	-	47,763	14,343	62,106
Disposals	(47)	(2)	(2,554)	-	(2,603)	(49)	(2,652)
Impairments	1,337	-	-	-	1,337	-	1,337
Reclassification	6	-	(6)	-	-	-	-
Revaluation	30,407	15,158	89	-	45,654	-	45,654
At 31 March 2008	**45,386**	**74,199**	**491,518**	**-**	**611,103**	**14,294**	**625,397**
Net book value							
At 1 April 2007	**218,712**	**20,770**	**166,844**	**149,630**	**555,956**	**285,035**	**840,991**
At 31 March 2008	**187,295**	**9,316**	**152,213**	**204,974**	**553,798**	**303,450**	**857,248**

Notes:

a. The Council's land and buildings were professionally re-valued by James Barr Ltd. as at 31 March 2008. Plant and equipment assets were professionally re-valued by Hickman-Shearer as at 1 April 2006. The interest in the Polaris House property was valued on a open market value for existing use basis as at 31 March 2006 by Powis Hughes and Associates. All valuations were performed in accordance with guidance notes issued by the Royal Institution of Chartered Surveyors.

b. The Assets under Construction (AUC) balance includes £3.2 million that represents the Council's individual share of the Shared Services Centre currently being developed by the seven Research Councils. AUCs are not depreciated until they are brought into use.

c. In accordance with FRS12 decommissioning costs are recognised in full as soon as the obligation exists i.e. when the technical facility has been commissioned. A corresponding asset in respect of the provision is set up in the balance sheet and depreciated over the useful life of the asset. The value of land and buildings and plant and machinery include £2.4 million (2006-2007: £2.4 million) and £7.2 million (2006-2007: £7.0 million) of decommissioning costs respectively. Accumulated depreciation at 31 March 2008 amounted to £1.6 million (2006-2007: £1.4 million) on the land and building decommissioning asset and £2.6 million (2006-2007: £2.5 million) for the plant and machinery decommissioning assets.

d. Leasehold land and buildings comprises leased land and buildings on leased land. In consideration of a one-off payment of £4.095 million the Council has leased land from the United Kingdom Atomic Energy Authority (UKAEA) for a period of 50 years from 31 January 2003. This land has been capitalised and is being depreciated over the term of the lease.

e. The Council has granted an operating lease to Diamond Light Source Limited (DSDL), the joint venture company in which it holds the majority (86%) shareholding. This lease is for a peppercorn rent for a period of 40 years from 31 January 2003. The lease covers part of the land leased to the Council from the UKAEA and part of the Council's own land.

f. The net book value STFC's Land and Buildings was derived from the following classes of asset:

	2008 £000	2007 Restated £000
Freehold	187,295	218,712
Short leasehold	9,316	20,777
	196,611	239,489

The net book value of short leasehold property includes decommissioning costs.

11. INVESTMENTS*

	STFC	STFC Group	Interest in DLSL Joint Venture	Consolidated Total
	£'000	£'000	£'000	£'000
Cost				
At 1 April 2007	-	136	-	136
Additions	-	-	-	-
At 31 March 2008	**-**	**136**	**-**	**136**
Depreciation				
At 1 April 2007	-	-	-	-
Impairment	-	75	-	75
Charged in year	-	-	-	-
At 31 March 2008	**-**	**75**	**-**	**75**
Net book value				
At 1 April 2007	-	136	-	136
At 31 March 2008	**-**	**61**	**-**	**61**

*Represents STFC's investment in Central Laboratory Innovation and Knowledge Transfer Ltd.

Central Laboratory Innovation and Knowledge Transfer Limited (registration number 4361684)

On 4 April 2002, the Council established its own wholly owned subsidiary company known as Central Laboratory Innovation and Knowledge Transfer Limited (CLIK). The Council's current shareholding in CLIK is 1 ordinary share of £1.

The operating results, assets and liabilities of CLIK are reflected in the Council's group accounts in accordance with generally accepted accounting standards.

Shared Services Centre

During the year the Council acquired one 'A' ordinary share of £1 in RCUK Shared Services Centre Limited (RCUK SSC Ltd). Each of the seven Research Councils acquired one share and all are joint investors in the project. RCUK SSC Ltd. was incorporated on 1 August 2007 and has commenced setting up the Shared Services Centre. For the period ended 31 March 2008 the draft financial statements of RCUK SSC Ltd. show revenue of £1,225,593 and administration costs of £1,255,593 with a nil profit/loss result. The balance sheet totals are £7 from the share capital issued to the Reseach Councils and £7 cash.

The investment has been classified as 'other investment' as each Council's individual share is 14%.

	2008	2007
	£	£
Other investment	1	-

Spectrum (General Partner) Limited (registration number 4409886)

The Council holds 21,875 ordinary shares of 0.01p (21.875% interest) in Spectrum (General Partner) Limited. This company was set up to act as the Advisory Board for the Rainbow Seed Fund (RSF) and its purpose is to ensure that the RSF operates within the parameters set out by DIUS and to monitor the performance of the Fund and the Fund Manager.

The RSF is a limited partnership comprised of four core partners (the Science and Technology Facilities (STFC), the Biology and Biological Science Research Council (BBSRC), the Natural Environment Research Council (NERC) and the Defence Science and Technology Laboratory (Dstl)) and seven associate partners (the United Kingdom Atomic Energy Authority, Culham, The Central Science Laboratory (CSL), The Health Protection Agency (HPA), The Veterinary Laboratories Agency (VLA), The National Physical Laboratory (NPL), The Scottish Crop Research Institute (SCRI) and The Macaulay Land Use Research Institute).

The Fund provides seed capital investment to commercialise the outcomes of science research in the publicly funded partner organisations' Government facilities. Midven Limited manages the Fund under contract.

No entry is made in the Balance Sheet as the value of the holdings and the trading position of these companies is not material to the accounts.

Other investments

The Council also holds minority shareholdings in the following company whose registered office is in England:

Name of Company	Registration Number	Percentage Shareholding
Neos Interactive Limited	3564252	<1

STFC's interest in Laserthor (Company registration number 3869946) was transferred to CLIK during 2007-2008.

With the approval of all the shareholders, MRBP Research Limited (company registration number 4113380) was dissolved on 24 July 2007 following transfer of its assets and liabilities to University College Cardiff Consultants Limited (UC3, the IP holding company of Cardiff University).

No entry is made in the Balance Sheet as the value of the holdings and the trading position of these companies is not material to the accounts.

Harwell Science and Innovation Campus (HSIC)

In connection with the Harwell Science and Innovation Campus two new entities were formed in February 2008: Harwell Science and Innovation Campus Public Sector Limited Partnership (PubSP) and Harwell Science and Innovation Campus Public Sector General Partner Limited (PubSP GP).

Harwell Science and Innovation Campus Public Sector Limited Partnership (PubSP) has been formed to acquire and hold the public sector's financial interest in the HSIC joint venture and consider matters coming to the board of the HSIC joint venture. PubSP has been set up under Scottish law so that it is a separate legal entity in its own right separate from that of its partners. The partners in this are UKAEA, STFC and Harwell Science and Innovation Campus Public Sector General Partner Limited (PubSP GP). STFC and UKAEA each have one £1,000 unit in the partnership. PubSP GP made a notional capital contribution of £1.

PubSP GP is a company limited by shares and is owned 50% each by STFC and UKAEA, who both have 2 directors on the board. STFC and UKAEA each have one £1 share. PubSP GP will for all intents and purposes be a dormant company as the partnership is bearing all the costs (of which 50% are ultimately reimbursed by STFC).

The only costs incurred by PubSP for the year ended 31 March 2008 were in relation to set up costs and operator fees invoiced by Mourant, the FSA licensed operator appointed by the partnership. STFC's share of these expenses (approximately £5,000) was settled from the partnership's bank account subsequent to the year-end.

Legal negotiations have not yet been concluded in relation to the main HSIC joint venture, which will be formed by PubSP and a private sector partner to develop the Harwell Science and Innovation Campus.

Daresbury Science and Innovation Campus (DSIC)

Daresbury Science and Innovation Campus Ltd was established on 18 September 2006 as a company limited by guarantee and its board includes representatives from each of the following six stakeholder organisations ('members'): Northwest Regional Development Agency (NWDA), Halton Borough Council, Science and Technology Facilities Council (STFC), University of Lancaster, University of Liverpool, and the University of Manchester. NWDA and STFC each have two seats on the Board.

No entry is made in the Balance Sheet in respect of HSIC and DSIC as the value of the holdings and the trading position of these companies is not material to the accounts.

12. INVESTMENT IN JOINT VENTURE

	STFC	STFC Group	Interest in DLSL Joint Venture	Consolidated Total
	£'000	£'000	£'000	£'000
Cost				
At 1 April 2007	255,605	255,605	(255,605)	-
Additions	29,765	29,765	(29,765)	-
At 31 March 2008	**285,370**	**285,370**	**(285,370)**	**-**
Depreciation				
At 1 April 2007	-	-	-	-
Charged in year	13,385	13,385	(13,385)	-
At 31 March 2008	**13,385**	**13,385**	**(13,385)**	**-**
Net book value				
At 1 April 2007	255,605	255,605	(255,605)	-
At 31 March 2008	**271,985**	**271,985**	**(271,985)**	**-**

On 27 March 2002, the Department for Innovation, Universities and Skills transferred their 86% interest in the Joint Venture company Diamond Light Source Limited (DLSL) to the Council. The remaining 14% is held by Wellcome Trust Limited.

The appropriate share of the operating results, assets and liabilities of DLSL are reflected in the Council's consolidated Accounts in accordance with generally accepted accounting standards.

The Council's shareholding in DLSL at 31 March 2008 is 277,930,500 ordinary shares of £1 each and 7,439,867 redeemable preference shares of £1 each.

13. DEBTORS

(a) Analysis by type

Amounts falling due within one year	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 Restated £'000
Trade debtors	10,085	10,263	80	10,343	8,811
Other debtors and accruals	605	810	942	1,752	2,852
Prepayments and accrued income	26,041	26,041	231	26,272	18,687
Amounts recoverable on long term contracts	9,402	9,402	-	9,402	9,978
Early retirements – amounts recoverable	1,023	1,023	-	1,023	991
Total	**47,156**	**47,539**	**1,253**	**48,792**	**41,319**

Amounts falling due after one year	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 £'000
Early retirements – amounts recoverable	4,325	4,325	-	4,325	3,423
Loans to staff	160	160	-	160	158
Total	**4,485**	**4,485**	**-**	**4,485**	**3,581**

(b) Analysis by source

Amounts falling due within one year	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 Restated £'000
Other central government bodies	8,957	9,133	941	10,074	5,213
Local authorities	-	-	-	-	211
Public corporations and trading funds	146	146	-	146	100
Bodies external to government	38,053	38,260	312	38,572	35,795
Total	**47,156**	**47,539**	**1,253**	**48,792**	**41,319**

Amounts falling due after one year	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 £'000
Other central government bodies	4,325	4,325	-	4,325	3,423
Bodies external to government	160	160	-	160	158
Total	**4,485**	**4,485**	**-**	**4,485**	**3,581**

14. CREDITORS

(a) Analysis by type

Amounts falling due within one year	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 Restated £'000
Trade creditors	15,574	15,884	1,574	17,458	27,344
Other creditors	7,586	9,173	3,273	12,446	6,368
Accruals and deferred income	60,974	60,974	8,888	69,862	42,111
Corporation tax	-	-	69	69	134
Early retirement costs	2,013	2,013	-	2,013	1,681
Total	**86,147**	**88,044**	**13,804**	**101,848**	**77,638**

Amounts falling due after one year	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 £'000
HMRC VAT repayment	-	-	24,433	24,433	27,600
Early retirement costs	9,514	9,514	-	9,514	5,559
Total	**9,514**	**9,514**	**24,433**	**33,947**	**33,159**

(b) Analysis by source

Amounts falling due within one year	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 Restated £'000
Other central government bodies	8,210	10,107	3,339	13,446	6,582
Local authorities	3	3	-	3	-
NHS bodies	3	3	-	3	-
PC and trading funds	35	35	-	35	-
Bodies external to government	77,896	77,896	10,465	88,361	71,056
Total	**86,147**	**88,044**	**13,804**	**101,848**	**77,638**

Amounts falling due after one year	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 £'000
Other central government bodies	649	649	24,433	25,082	27,600
Bodies external to government	8,865	8,865	-	8,865	5,559
Total	**9,514**	**9,514**	**24,433**	**33,947**	**33,159**

15. PROVISIONS

Decommissioning

	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 £'000
Balance at 1 April	16,768	16,768	10,731	27,499	26,133
Increase in provision	-	-	-	-	1,982
Adjustment to opening balance*	-	-	27	27	-
Utilisation of provision	-	-	-	-	-
Reduction in provision	(151)	(151)	-	(151)	(1,000)
Unwinding of discount	362	362	443	805	384
Balance at 31 March	**16,979**	**16,979**	**11,201**	**28,180**	**27,499**

*Arises due to change in ownership between opening and closing balances from 0.8611% to 0.8631%.

Restructuring

	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 £'000
Balance at 1 April	1,997	1,997	-	1,997	7,625
Increase in provision	200	200	-	200	-
Utilisation of provision	(952)	(952)	-	(952)	(5,628)
Reduction in provision	(307)	(307)	-	(307)	-
Unwinding of discount	-	-	-	-	-
Balance at 31 March	**938**	**938**	**-**	**938**	**1,997**

Restructuring: SR Closure

	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 £'000
Balance at 1 April	26,062	26,062	-	26,062	25,502
Increase in provision	-	-	-	-	-
Utilisation of provision	(3,162)	(3,162)	-	(3,162)	-
Reduction in provision	(6,835)	(6,835)	-	(6,835)	-
Unwinding of discount	-	-	-	-	560
Balance at 31 March	**16,065**	**16,065**	**-**	**16,065**	**26,062**

Restructuring: Shared Services Centre

	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 £'000
Balance at 1 April	-	-	-	-	-
Increase in provision	789	789	-	789	-
Utilisation of provision	-	-	-	-	-
Reduction in provision	-	-	-	-	-
Unwinding of discount	-	-	-	-	-
Balance at 31 March	**789**	**789**	**-**	**789**	**-**
Total Provisions	**34,771**	**34,771**	**11,201**	**45,972**	**55,558**

Decommissioning of technical facilities

In accordance with FRS 12: *Provisions, Contingent Liabilities and Contingent Assets* decommissioning costs are recognised in full as soon as the obligation exists. A corresponding asset is set up in the balance sheet at the same time with depreciation being charged to the Statement of Net Expenditure over its useful life.

STFC

The Council has in place plans for the decommissioning of the ISIS pulsed neutron source at the Rutherford Appleton Laboratory at the end of its anticipated operating life in 2020. STFC's technical facilities at the island sites (JAC and ING) are long term in nature and estimated to have a thirty year operating life. It is deemed probable that at the end of this life span, or STFC's earlier withdrawal, there would be a requirement to decommission existing facilities. A provision has been created to cover the identified decommissioning costs.

The estimated cost of decommissioning the facilities commencing in 2020 for ISIS and between 2009-2010 and 2012-2013 for the island sites is currently estimated at £26.4 million, after allowing for inflation. This amount is discounted at the Council's long term liabilities discount rate of 2.2% to arrive at a current provision of £16.979 million.

DLS joint venture

Diamond Light Source Ltd is required under the terms of the joint venture agreement to decommission the Synchrotron at the end of its anticipated operating life in 2057. A provision has been established for this purpose based on externally provided quotations for the buildings and cost estimates for the machine, beamlines and incidentals, and after allowing for notional inflation at 4.5% per annum. This amount is discounted at 4.4% which represents the company's post tax rate for interest receivable, to arrive at the current provision of £12.98 million of which STFC's share is £11.2 million.

Restructuring

Of the closing balance of £938,000, £746,000 is provided for restructuring at the UK ATC in Edinburgh, £146,000 is for closure of the Cambridge site, with the balance of £46,000 being provided for the Ground Based Astronomy programme of restructuring.

The remaining early retirement/severance costs of those staff released under the 'Fit for the Future (FFTF)' (£653,000) were charged to the ex-CCLRC FFTF provision in year. The remaining balance of £307,000 was released to the SNE leaving a zero balance.

Restructuring: SRS closure

On 7 March 2005, Lord Sainsbury, the then DTI Minister for Science and Innovation, announced that the Daresbury Synchrotron Radiation Source (SRS) would cease operations on 31 December 2008. STFC estimated the costs of discontinuing the operation of this facility, including the minor decommissioning of the facility, as £27.6 million, after allowing for inflation. The provision was reviewed at the end of 2007-2008 and estimated at £16.065 million for the remaining two years after allowing for inflation.

Restructuring: Research Council Shared Services Centre

The Research Councils and the Research Council Shared Services Ltd. are in the process of developing a Shared Services Centre to carry out the central functions of HR, Finance and IT across the Councils. As a result some Research Councils will incur redundancy costs, particularly where existing staff live a distance away from Swindon where the Centre will be located.

The Research Councils have collectively agreed that they will be jointly liable for all necessary redundancies. The Councils have calculated their likely redundancy liabilities in order to make the 2007-2008 provision. A funding allocation model was developed and agreed by all the Research Councils and this identified the proportion of SSC project spend and liability that each individual Council would incur. The total provision for redundancies has been apportioned using this model. The table below shows, for each Council, the amount that they need to provide for redundancies of their own staff. Some Councils will incur a cost for terminating their existing systems and these costs are also being shared. It then notes the proportion of the total liability that it will incur and the amount of provision that that represents. The figure below this denotes the contributions that an individual Council has from the other Research Councils. The bottom line shows the net provision they have recorded in each Council. Further costs may be incurred in future years.

	AHRC £'000	BBSRC £'000	ESRC £'000	EPSRC £'000	MRC £'000	NERC £'000	STFC £'000	Total £'000
Provision required for the Council's own redundancies	68	151	-	-	999	1,620	-	2,839
System termination fee	-	-	-	-	1,000	-	-	1,000
Total provision	68	151	-	-	1,999	1,620	-	3,839
% of liability to be borne by the Council	1.33%	20.54%	1.83%	8.24%	26.98%	20.54%	20.54%	100%
Amount borne by the Council	1	31	-	-	539	333	-	904
Contributions towards Council's redundancy and system termination provision received from/provided to other Council's	50	758	316	70	496	456	789	2,935
Net provision required for each Council	**51**	**789**	**316**	**70**	**1,035**	**789**	**789**	**3,839**

This table is replicated across all the Research Council Annual Accounts.

16. GOVERNMENT FUNDS

Income and expenditure reserve

	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 Restated £'000
Balance at 1 April	579,325	578,380	1,321	579,701	491,367
Adjustment to opening balance*	-	-	3	3	-
Grant in aid financing	558,749	558,749	-	558,749	527,601
Other capital financing	3,880	3,880	-	3,880	4,553
Funding from international partners	1,625	1,625	-	1,625	4,131
Grant from Joint Infrastructure Fund	138	138	-	138	107
Reversal of cost of capital	26,327	26,327	-	26,327	24,394
Tranfer from revaluation reserve	9,653	9,653	-	9,653	3,676
Net expenditure for the year	(538,720)	(538,971)	(1,324)	(540,295)	(476,128)
Balance at 31 March	**640,977**	**639,781**	**-**	**639,781**	**579,701**

*Arises due to change in ownership between opening and closing balances from 0.8611% to 0.8631%.

Revaluation reserve

	STFC 2008 £'000	STFC Group 2008 £'000	Interest in DLSL Joint Venture 2008 £'000	Consolidated Total 2008 £'000	Consolidated Total 2007 Restated £'000
Balance at 1 April	176,870	177,007	-	177,007	129,582
Surplus on revaluation	(30,731)	(30,807)	-	(30,807)	51,100
Transfer to income and expenditure reserve	(9,653)	(9,653)	-	(9,653)	(3,676)
Balance at 31 March	**136,486**	**136,547**	**-**	**136,547**	**177,006**
Total Government Funds at 31 March 2008	**777,463**	**776,328**	**-**	**776,328**	**756,707**

17. RECONCILIATION OF THE OPERATING DEFICIT TO NET CASH (OUTFLOW) FROM OPERATING ACTIVITIES

	STFC Group 2007-2008 £'000	STFC Group 2006-2007 Restated £'000
Net operating costs	(538,394)	(474,962)
Depreciation charges	61,148	37,498
Use of restructuring provision	(4,114)	(5,628)
Decrease in provisions (net)	(6,304)	(1,000)
Decrease in stocks	62	6
Impairment of fixed assets	1,972	883
Cost of capital	26,327	24,394
Decrease/(increase) in debtors	(8,640)	3,393
(Decrease)/increase in creditors	18,065	13,777
Net cash (outflow) from operating activities	**(449,878)**	**(401,639)**

18. ANALYSIS OF CHANGES IN NET FUNDS

	STFC 2007-2008 £'000	STFC Group 2007-2008 £'000	Interest in DLSL Joint Venture 2007-2008 £'000	Consolidated Total 2007-2008 £'000	Consolidated Total 2006-2007 Restated £'000
Balance at 1 April	20,246	21,160	15,789	36,949	24,681
Increase in cash	10,201	9,605	931	10,536	12,268
Balance at 31 March	**30,447**	**30,765**	**16,720**	**47,485**	**36,949**

Of the Net Funds at 31 March, £17.8 million (2006-2007: £11.4 million) was held by the Office of the Paymaster General (OPG). The balance was held in commercial bank accounts.

19. CONTINGENT LIABILITIES

From 1 April 2007, the STFC took over responsibility for the United Kingdom's (UK's) subscriptions to the Institut Laue Langevin (ILL) and the European Synchrotron Radiation Facility (ESRF). As a consequence of this the STFC inherited the UK's share of the likely decommissioning and other costs of these facilities to be met in future years. As there has been no past obligating event (STFC does not have singular control over the decommissioning and other costs of these facilities) and as the timing and amount of the decommissioning and other costs cannot be known with any certainty these decommissioning costs have been treated as a contingent liability in accordance with FRS12. The estimated value of the contingent liability at 31 March 2008 is £40 million (ILL £38 million and ESRF £2 million), 2006-2007: £48 million (ILL £46 million and ESRF £2 million).

As set out under note 8 the Council collaborated with a number of other international partners in the funding, management and operation of technical facilities which were not owned by STFC. In the event of a decision to withdraw from any of these arrangements, it is likely that STFC would assist in the search for a replacement partner to ensure that technical commitments were met. The most significant international collaborations are in respect of the European Organisation for Nuclear Research (CERN), the European Southern Observatory (ESO), and the European Space Agency (ESA). In addition, STFC was a member of the Gemini collaboration. For each of these four facilities there was the possibility that STFC would be obliged to contribute to decommissioning costs arising from a decision taken to discontinue operations. The decisions to decommission were not wholly within STFC's control. There were no current plans for decommissioning nor were there any plans for STFC to withdraw from these facilities.

On the basis of legal advice sought during the year STFC is not deemed to have a liability in respect of the late delivery to ESO of the Visable and Infrared Survey Telescope for Astronomy (VISTA).

20. DERIVATIVES AND OTHER FINANCIAL INSTRUMENTS

FRS 13, *Derivatives and Other Financial Instruments*, requires disclosure of the role which financial instruments have had during the period in creating or changing the risks an entity faces in undertaking its activities. Because of the largely non-trading nature of its activities and the way in which government bodies are financed, STFC is not exposed to the degree of financial risk faced by business entities. Moreover, financial instruments play a much more limited role in creating or changing risk than would be typical of the listed companies to which FRS 13 mainly applies. STFC has very limited powers to borrow or invest surplus funds and except for relatively insignificant forward purchases of foreign currency, financial assets and liabilities are generated by day-to-day operational activities and are not held to change the risks facing the Council in undertaking its activities.

Liquidity risk

STFC's net revenue resource requirements are financed by resources voted annually by Parliament, and administered as grant-in-aid through the Department for Innovation, Universities and Skills, just as its capital expenditure largely is. STFC is not therefore exposed to significant liquidity risks.

Interest-rate risk

All of STFC's financial assets and liabilities carry nil or fixed rates of interest and STFC is not therefore exposed to interest-rate risk.

Foreign currency risk

STFC's exposure to foreign currency risk is not significant because the risk exposure on STFC's principal international subscriptions is covered by the Department for Innovation, Universities and Skills, whereby STFC is compensated for variances from a base position. At the instigation of DIUS, the compensation arrangements are to end with effect from the end of the current spending review period on 31 March 2008.

With the agreement of DIUS and HM Treasury, STFC operates its own Euro bank accounts to minimise its exposure to risk in this currency. In addition, forward currency contracts eliminate currency exposure on smaller international subscriptions where payments are due on fixed dates in each financial year. Further information relating to the forward purchase contracts is in note 21.

21. COMMITMENTS

The Council had the following commitments at the balance sheet date:

a. Research grants

	£'000
Payable within 1 year	106,499
Payable in 2 to 5 years	175,242
Payable beyond 5 years	499
Total commitment	282,240

b. Capital expenditure

	2008	**2007** Restated
	£'000	£'000
Contracted but not provided for	19,917*	17,903

**Figure includes £3.4 million that represents the Council's individual share of the future committed spend on the Shared Services Centre. Costs incurred to 31 March 2008 have been recognised through the Income and Expenditure account and the Asset in the Course of Construction.*

c. ESO Capital contribution

	£'000
Payable within 1 year	6,976
Payable in 2 to 5 years	26,572
Total commitment	33,548

d. Operating leases

Annual commitments at 31 March	**Land and buildings**		**Other leases**	
	2008	**2007** Restated	**2008**	**2007** Restated
	£'000	£'000	£'000	£'000
Expiring within one year	141	124	5	6
Expiring in the second to fifth years	101	89	31	36
	242	213	36	42

e. Foreign exchange

Contracts to the value of £49 million (2006-2007: £46.5 million) were in place with the Bank of England at 31 March 2008 for the forward purchasing of Foreign Currency in April 2008. These contracts were to facilitate the payment of contributions to CERN.

22. RELATED PARTY TRANSACTIONS

The Science and Technology Facilities Council (the Council) is a Non-Departmental Public Body (NDPB) sponsored by the Department for Innovation, Universities and Skills (DIUS).

DIUS is regarded as a related party. During the year, the Council had various material transactions with DIUS and with other entities for which DIUS is the sponsoring or parent body: Biotechnology and Biological Sciences Research Council, Engineering and Physical Sciences Research Council, Economic and Social Research Council, Medical Research Council, Natural Environment Research Council, Ofcom. The income generated from these bodies is set out in note 2.

In addition the Council had various material transactions with other Government Departments and other central government bodies and the income generated from these bodies is set out in note 2.

As set out in note 12 above, the Council holds the major interest in Diamond Light Source Limited (DLSL). Related party transactions with DLSL for the period ending 31 March 2008 were as follows:

	£'000
Provision of technical and scientific manpower and other services	2,651
Costs collected on behalf of DLSL	107
DLSL invoices to STFC	331
Total	**3,089**

The related party transactions disclosed above exclude funding of the joint venture which is disclosed on the face of the Consolidated Statement of Net Expenditure.

During the year, the Council authorised grants and awards and entered into contracts for goods and services with institutions or other bodies where Council members hold senior positions and where employees of the Council hold honorary or part-time teaching positions or undertake work in a private consultancy capacity. The numbers and aggregate values of such contracts, grants and awards were as follows:

Name and related party **Council members**	**Number of of grants**	**Aggregate value £'000**	**Number of awards**	**Aggregate value £'000**	**Number of contracts**	**Aggregate value £'000**
Mr Peter Warry						
University of Warwick	4	2,885	4	204	1	20
University of Reading	-	-	-	-	-	-
Victrex PLC	-	-	-	-	-	-
BSS Group PLC	-	-	-	-	-	-
Professor Keith Mason*						
University of Wales, Aberystwyth	1	13	1	51	1	2
Professor Keith Burnett						
University of Oxford	12	6,064	25	1,674	13	1,033
University of Sheffield	8	4,686	8	409	12	30
Professor Mike Edmunds						
University of Cardiff	8	1,339	6	308	-	-
Dr Philip Kaziewicz						
University College, London	18	6,752	19	1,304	6	240
Professor Richard Wade*						
University of Oxford	12	6,064	25	1,674	13	1,033
University of Wales, Aberystwyth	1	13	1	51	1	2
Professor Colin Whitehouse*						
University of Birmingham	11	3,614	7	375	1	6
University of Oxford	12	6,064	25	1,674	13	1,033

*Also a member of staff

Name and related party Members of staff	Number of of grants	Aggregate value £'000	Number of awards	Aggregate value £'000	Number of contracts	Aggregate value £'000
Professor Mike Dunne						
Imperial College, London	21	10,335	20	1,328	7	402
Mr Richard Holdaway						
University of Southampton	1	194	6	355	4	745
Orbital Optics	-	-	-	-	-	-
Thruvision	-	-	-	-	-	-
Professor Keith Jeffery						
University College of Wales, Cardiff	8	1,339	6	308	1	1
Heriot Watt University	2	665	-	-	-	-
Mr Pavel Matousek						
Litheru Ltd	-	-	-	-	-	-
Professor Norman McCubbin						
University of Bristol	3	1,851	4	209	3	51
Mr Mike Poole						
University of Liverpool	4	1,245	7	376	4	303
Doctor David Parker						
BNSC Group	-	-	-	-	-	-
Professor Bruce Swinyard						
University College of Wales, Cardiff	8	1,339	6	308	-	-
University of Wales, Aberystwyth	1	13	1	51	-	-
Mr Patrick Wallace						
Tpoint Software	-	-	-	-	-	-
Mr Nick Waltham						
MDA/OOL	-	-	-	-	-	-

None of the above named persons was involved in the authorisation of grants or awards or was involved in the placing of contracts with the institutions or bodies where they hold senior positions or, in the case of employees of the Council, hold honorary or part-time teaching positions.

The Council also provided time on its scientific facilities, either paid for directly by users, or funded by grant-giving bodies (principally the other UK Research Councils), to researchers at institutions where Council members hold senior positions and where employees of the Council hold honorary or part-time teaching positions. The related parties using the Council's facilities were as follows:

Name	Related Party
Council members	
Mr Peter Warry	University of Warwick
	University of Reading
Professor Keith Mason	University of Wales, Aberystwyth
Professor Keith Burnett	University of Oxford
	University of Sheffield
Professor Mike Edmunds	University of Cardiff
Professor Richard Wade	University of Oxford
	University of Wales, Aberystwyth
Professor Colin Whitehouse	University of Birmingham
	University of Oxford
Members of staff	
Doctor Tim Bestwick	Thruvision
	Orbital Optics
Professor Mike Dunne	Imperial College, London
Mr Richard Holdaway	University of Southampton
	Thruvision
	Orbital Optics
Professor Keith Jeffery	University College of Wales, Cardiff
	Heriot Watt University
Professor Norman McCubbin	University of Bristol
Doctor David Parker	EADS NV
Professor Bruce Swinyard	University College of Wales, Cardiff
	University of Wales, Aberystwyth
Mr Mike Poole	University of Liverpool
Doctor Nick Waltham	MDA/OOL

None of the above named persons was involved in the award of facility time to the institutions or bodies where they hold senior positions or, in the case of employees of the Council, hold honorary or part-time teaching positions.

23. CCLRC AND PPARC

STFC was established on 1 April 2007 upon the merger of PPARC and CCLRC. At that date all the assets of PPARC and most of the CCLRC assets were transferred by a transfer order to STFC. PPARC was wound up on 14 November 2007; CCLRC has not been wound up yet as it still holds some patent agreements with foreign parties. The legal changes to transfer these small value patent agreements to STFC are lengthier than in the UK so the assets were unable to be included in the original transfer order.

The Accounts Direction given by the Secretary of State for Innovation, Universities and Skills in accordance with Section 2 (2) of the Science and Technology Act 1965 applied to STFC, CCLRC and PPARC. The Accounts Direction required separate disclosure of any residual transactions relating to PPARC and CCLRC in accordance with FReM requirements. In 2007-2008 the expenditure incurred by the two predecessor Councils was:

	2007-2008 £'000	
	CCLRC	**PPARC**
Council and Audit Committee expenses	95	47
Transfer of Intellectual Property Rights held in foreign countries	33	-
	128	47

24. POST BALANCE SHEET EVENTS

FRS 21, *Events after the Balance Sheet Date*, requires the disclosure of the date on which the financial statements were "authorised for issue" and who gave that authorisation. The financial statements were authorised for issue on 17 July 2008 by Professor Keith Mason, STFC Accounting Officer.

Statistics: grants, fellowships and awards

RESEARCH GRANTS

Summary of successful applications during the financial year 2007-2008

Institution	No. of awards	Value by subject area (£'000)							
		Astronomy	Space Missons/ Ground Based Facilities	Telescope Time	Project Peer Review Panel	Particle Physics	Nuclear Physics	e-Science	Total £'000
Universities and colleges									
Birmingham	3	338.22	9.15	-	-	47.73	-	-	395.10
Bradford	2	-	285.05	-	-	-	-	-	285.05
Bristol	2	648.69	-	-	-	-	-	-	648.69
Brunel	6	-	414.39	-	-	-	-	-	414.39
Cambridge	13	2,127.00	1,084.57	38.88	513.10			110.79	3,874.34
Cardiff	4	66.51	839.56	49.75	-	-	-	-	955.82
Central Lancashire	3	643.45	-	-	-	-	-	-	643.45
Cranfield	1	-	228.48	-	-	-	-	-	228.48
Durham	4	5,651.90	190.98	-	-	-	-	-	5,842.88
Edinburgh	2	-	-	16.65	-	-	-	147.21	163.87
Glasgow	2	1,317.85	43.47	-	-	-	-	-	1,361.31
Imperial College, London	19	320.68	2,456.29	-	1,297.51	219.34	-	-	4,293.82
Kent	1	543.62	-	-	-	-	-	-	543.62
Lancaster	3	591.50	21.35	-	-	26.11	-	-	638.96
Leeds	2	1,929.07	-	-	-	-	-	-	1,929.07
Leicester	8	-	4,415.90	-	-	-	-	-	4,415.90
Liverpool	1	-	-	-	-	149.97	-	-	149.97
Manchester	9	3,032.61	611.40			55.66	24.23	-	3,723.90
Newcastle	1	8.44	-	-	-	-	-	-	8.44
Nottingham	2	1,864.93	-	18.17	-	-	-	-	1,883.11
Open University	6	4,438.89	190.28	-	-	-	-	-	4,629.17
Oxford	9	3,076.03	652.57	-	-	-	-	-	3,728.60
Portsmouth	1	1,112.32	-	-	-	-	-	-	1,112.32
Queen Mary, University of London	3	681.33	-	2.71	-	-	-	-	684.05
Queen's University of Belfast	1	2,147.91	-	-	-	-	-	-	2,147.91
Sheffield	5	1,976.50	-	43.93	-	31.52	-	-	2,051.95
St Andrews	1	353.76	-	-	-	-	-	-	353.76
Strathclyde	2	-	-	9.63	-	-	-	-	9.63
Sussex	2	2,441.71	-	5.60	-	-	-	-	2,447.31
University College, London	13	2,346.84	2,186.14	64.26	-	-	-	-	4,597.25
Warwick	3	2,220.85	-	-	-	68.83	-	-	2,289.68
West of Scotland	1	-	64.92	-	-	-	-	-	64.92
York	1	-	-	-	-	-	26.40	-	26.40
Research facilities									
Armagh Observatory	2	667.86	-	-	-	-	-	-	667.86
Rutherford Appleton Laboratory	1	-	-	-	-	-	5.35	-	5.35
UK Astronomy Technology Centre	6	-	-	6.88	-	-	-	-	6.88
Other									
BAE Systems	1	-	39.96	-	-	-	-	-	39.96
EADS Astrium	1	-	-	-	137.08	-	-	-	137.08
QinetiQ (Malvern)	1	-	135.74	-	-	-	-	-	135.74
SciSys Ltd	1	-	-	-	72.45	-	-	-	72.45
The Natural History Museum	3	13.77	47.67	-	-	-	-	-	61.44
Totals	**152**	**40,562.24**	**13,917.85**	**256.48**	**2,020.14**	**599.17**	**55.98**	**258.00**	**57,669.86**

Notes: A total of 263 applications for research grants were submitted and peer reviewed during 2007-2008, requesting over £177 million. 152 awards were approved by peer review (receiving over £57 million in total); acheiving an overall success rate of 58%

* Fifty-seven further applications (requesting over £113 million in total) were still within the peer review system at 31 March 2008.

FACILITY DEVELOPMENT GRANTS

Success rates statistics from Call 4 (2006/2007) of the Facility Development Project Grants scheme:

Institutions	Expressions of interest			Full proposals			Awarded	
	Number submitted	Success rate by		Number submitted	Success rate by		Number	Amount £'000
		Number	Value		Number	Value		
Birkbeck, University of London	1	0%	0%	-	-	-	-	-
CCLRC	5	60%	15%*	5	40%	21%	2	236
Diamond Light Source	3	100%	100%	5	60%	70%	3	472
Imperial College, University of London	1	100%	100%	1	100%	100%	1	344
Queen Mary, University of London	1	0%	0%	-	-	-	-	-
University of Edinburgh	1	100%	100%	1	100%	100%	1	432
University of Manchester	1	0%	0%	-	-	-	-	-
University of Oxford	2	50%	81%	1	100%	100%	1	826
University of Reading	2	0%	0%	-	-	-	-	-
Total	17	53%	35%	13	62%	64%	8	2,310

Notes: Nine projects (12 individual grants) with a total value of £4.6 million were short-listed at the Expressions of Interest stage and submitted a full proposal. Of these, five projects (seven grants) with a total value of £2.3 million were funded. The awards were made in September 2007.

*One Expression of Interest of >£5 million value could not be considered as insufficient funds were available.

The Facility Development Project Grant scheme will be replaced with the new Facility Research and Development scheme (FRD) in 2008/2009. This new scheme intends to develop the current UK based large scale facilities (Central Laser Facility, Diamond, ISIS) to ensure that they remain world-leading and agile enough to address new scientific priorities. The FRD grants programme will support university and other public sector research establishment researchers working with in-house experts to improve instrumentation and equipment at these facilities.

KNOWLEDGE EXCHANGE

PIPSS Knowledge Transfer Scheme

Summary of the number of PIPSS (Industrial Programme Support Scheme) grants awarded during 2007-2008:

Grant type	Number	Value £'000
PIPSS awards	7	707.14
Defence and Security PIPSS	6	1,273.15
Mini PIPSS	8	361.06
Bio Mini PIPSS	6	405.59
PIPSS Follow-on fund	1	77.77
PIPSS Fellowship	1	254.77
Total	**29**	**3,079.48**

Notes: PIPSS awards support the development of effective, long term collaborations between UK Universities, CERN, ESO (European Southern Observatory), ESA (European Space Agency), UK industry and research sector organisations.

Patents

Number of new patents filed by STFC during 2007-2008:

Type	Number
Base patents (UK)	2
Patents filed in various countries	12
Total	**14**

Notes: The figures stated are based on the STFC's UK sites.

EDUCATION AND TRAINING

Research studentships – quota allocation 2008 and 2009

Institution	No. of studentships	
	2008	2009
Universities and colleges		
Aberystwyth	1	1
Birmingham	10	9
Bristol	4	3
Brunel	2	1
Cambridge	19	21
Cardiff	5	6
Central Lancashire	2	2
Durham	17	18
Edinburgh	12	12
Exeter	2	2
Glasgow	12	12
Hertfordshire	5	5
Imperial College London	18	19
Keele	2	3
Kent	1	-
Kings College London	2	1
Lancaster	5	3
Leeds	4	4
Leicester	8	8
Liverpool	14	15
Liverpool John Moores	4	5
Manchester	18	17
Newcastle upon Tyne	1	1
Nottingham	3	3
Open University	4	3
Oxford	19	20
Portsmouth	3	3
Queen Mary, University of London	6	6
Royal Holloway, University of London	3	2
Sheffield	7	5
Southampton	7	7
St Andrews	6	6
Surrey	3	3
Sussex	3	4
Swansea	3	3
University College London	12	12
Warwick	4	3
West of Scotland	1	1
York	2	2
Other		
Armagh Observatory	1	2
STFC Rutherford Appleton Laboratory, Particle Physics	3	3
The Natural History Museum	1	-
Total	259	256

RESEARCH FELLOWSHIPS

Summary of the number of fellowships awarded in 2007-2008:

Year	Fellowship type	Applications	Awards	Success rate
2007 - 2008	Postdoctoral	182 (45)	11 (2)	6% (18%)
	Advanced	183 (34)	11 (2)	6% (18%)
2006 -2007	Postdoctoral	117 (22)	12 (4)	10% (18%)
	Advanced	169 (37)	12 (4)	7% (11%)
2005 -2006	Postdoctoral	162 (40)	12 (5)	7% (13%)
	Advanced	150 (26)	11 (2)	7% (8%)
2004 -2005	Postdoctoral	175 (52)	14 (4)	8% (8%)
	Advanced	155 (21)	13 (1)	8% (5%)

Note: Data relating to female applicants is presented in brackets

SCIENCE IN SOCIETY

Summary of successful grant applications during the financial year 2007-2008

Universities	Awards	£'000
Cambridge	2	10.4
Cardiff	2	21.85
Durham	1	13.33
Liverpool John Moores	1	7.90
Manchester	2	12.00
Open University	1	5.03
Science centres, attractions and events *		
Hampshire Technology Centre Trust Ltd	1	10.00
National Eisteddfod of Wales	1	14.60
Thinktank Trust	1	20.00
W5 – WhoWhatWhereWhenWhy	1	20.00
Other		
The SHARE Initiative CIC	1	14.87
Total	**14**	**149.98**

Note: A total of 56 applications were submitted and peer reviewed during 2007-2008, requesting over £650 million.
Fourteen awards were approved by peer review, acheiving an overall success rate of 25%.
*Two further proposals (requesting over £193 million in total) were still within the peer review system at 31 March 2008.

Membership of Council and advisory bodies

THE COUNCIL

Chairman	**Mr Peter Warry FREng** Chairman of Victrex plc and BSS Group plc
Chief Executive	**Professor Keith Mason**
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	Mr Marshall Davies Independent Advisor
	Professor Michael Edmunds FRAS FinstP University of Cardiff
	Mr Philip Greenish CBE Royal Academy of Engineering
	Dr Philip Kaziewicz GI Partners
	Professor Anneila Sargent FRSA California Institute of Technology
	Professor Richard Wade STFC
	Professor Colin Whitehouse FREng STFC

Mr Paul Williams, Department for Innovation, Universities and Skills is observer to STFC Council on behalf of the Secretary of State for Innovation Universities and Skills.

Minutes of the Council's meetings are available on the STFC website at www.scitech.ac.uk/About/Strat/Council/council.aspx

COMMITTEES, BOARDS AND PANELS

Executive Board

Chair	**Professor Keith Mason** Chief Executive, STFC
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	Mr Paul Hartley Director Operations
	Mr Jim Sadlier Director Communications
	Mr Gordon Stewart (from 11/03/2008) Director Corporate and Commercial Affairs
	Dr Andrew Taylor OBE Director Facilities and Operations
	Dr Liz Towns-Andrews (from 11/03/2008) Director Knowledge Exchange
	Professor Richard Wade Chief Operating Officer and Deputy Chief Executive
	Professor Colin Whitehouse Director Campus Strategy
	Professor John Womersley (from 11/03/2008) Director Science programmes Office

Audit Committee

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External members	**Dr Derek Chadwick** Novartis Foundation
	Mr Rob Low
	Mr Ric Piper MA FCA

Science Board

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	Professor Jenny Thomas (Deputy Chair) University College London

Minutes of Science Board meetings are available on the STFC website at
www.scitech.ac.uk/About/Strat/Council/AdCom/SciBrd/contents.aspx

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	Professor Mike Bode Liverpool John Moores University
	Professor Jon Butterworth University College London
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	Professor Ruth Gregory University of Durham
	Professor Jordan Nash (Deputy Chair) CERN
	Professor Sheila Rowan FRSE University of Glasgow

Physical and Life Sciences Committee (PALS)

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	Professor Mike Gunn University of Birmingham
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	Professor Steven Rose Imperial College
	Professor Chick Wilson (Deputy Chair) University of Glasgow
	Professor Phil Withers University of Manchester

Education, Training and Careers Committee

Chair	**Professor Jim Hough FRS** University of Glasgow
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	Professor Phil Burrows University of Oxford
	Dr Susan Cartwright University of Sheffield
	Dr Chris Chaloner Systems Engineering and Assessment Limited
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	Professor Michele Dougherty Imperial College
	Professor Yvonne Elsworth University of Birmingham
	Professor Andrew Liddle University of Sussex
	Dr Paddy Regan University of Surrey

PEER REVIEW PANELS

Astronomy Grants Panel

Overall Chair	**Professor Mike Cruise** University of Birmingham
Sub-panels	
Rolling Grant Specialist Panel	**Professor Ian Smail** University of Durham
	Dr Phillip Bland University of Durham
	Dr Andrew Fazakerley University College London
	Professor Mike Jones University of Oxford
	Professor Andy Taylor Royal Observatory Edinburgh
Astronomy Observation	**Professor Tom Marsh** (Chair) University of Warwick
	Dr Simon Driver University of St Andrews
	Dr Katherine Romer University of Sussex
	Professor Albert Zijlstra University of Manchester
	Dr Alfonso Aragon-Salamanca University of Nottingham
	Dr Phillip Lucas University of Hertfordshire
Astronomy Theory	**Professor Richard Nelson** (Chair) Queen Mary, University of London
	Professor Phillip Dufton Queen's University, Belfast
	Dr Pedro Ferreira University of Oxford
	Professor Brad Gibson University of Central Lancashire
Solar Studies & Solar Terrestrial Physics	**Dr Tim Horbury** (Chair) Imperial College London
	Dr Mike Kosch Lancaster University
	Dr Clare Parnell University of St Andrews
	Dr Daniel Brown University of Wales, Aberystwyth
Planetary Studies Panel	**Professor Peter Read** (Chair) University of Oxford
	Dr Emma Bunce University of Leicester
	Dr Jamie Gilmour University of Manchester
	Dr Martin Lee University of Glasgow
	Dr John Murray Queen Mary, University of London

FELLOWSHIPS PANEL (STFC postdoctoral and advanced fellowships)

The Education, Training and Careers Committee
oversees the peer review of applications for STFC postdoctoral and advanced fellowships.

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	Professor Ian Bonnell St Andrews University
	Professor Phil Burrows Oxford University
	Dr Francesca Di Lodovico Queen Mary, University of London
	Professor Yvonne Elsworth Birmingham University
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	Dr Martin Haehnelt Cambridge University
	Professor Simon Hands Swansea University
	Professor Alan Heavens Edinburgh University
	Professor Hans Kraus Oxford University
	Dr Judith McGovern Manchester University
	Dr Stefano Moretti Southampton University
	Dr Paddy Regan Surrey University
	Dr Jason Stevens Hertfordshire University
	Professor Anne Taormina Durham University
	Dr Alberto Vecchio Birmingham University
	Dr Serena Viti University College London

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	Professor Martin Freer University of Birmingham
	Dr Dave Ireland University of Glasgow
	Dr Alex Murphy University of Edinburgh
	Professor Bob Wadsworth University of York
	Professor Phil Walker University of Surrey

Particle Physics Grants Panel

Chairs	**Professor Steve Lloyd** (Experiment) Queen Mary, University of London
	Professor Bill Spence (Theory) Queen Mary, University of London
Core members	**Dr Mark Lancaster** University College London (Experiment)
	Dr Georg Weiglein Institute for Particle Physics Phenomenology (Theory)
Non-core members	**Dr Stefan Soldner-Rembold** University of Manchester (Experiment)
	Dr Chris Parkes University of Glasgow (Experiment)
	Professor Fernando Quevedo University of Cambridge (Theory)
	Professor Christine Davies University of Glasgow (Theory)
	Dr Steve Worm STFC Rutherford Appleton Laboratory (Experiment)
	Dr Dan Tovey University of Sheffield (Experiment)
	Dr Rebecca Seviour Lancaster University (Experiment)
	Dr Nigel Watson University of Birmingham (Experiment)
	Dr Gary Barker University of Warwick (Experiment)
	Dr Philip Harris University of Sussex (Experiment)
	Dr Beatriz de Carlos University of Southampton (Theory)
	Professor Andreas Vogt University of Liverpool (Theory)

Projects Peer Review Panel

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	Dr Steve Boyd Warwick University
	Dr Craig Buttar (Deputy-Chair) Glasgow University
	Dr Richard Cole Mullard Space Science Laboratory
	Dr Brian Cox Manchester University
	Dr Antonella De Santo Royal Holloway
	Dr Vikram Dhillon Sheffield University
	Dr Andreas Freise University of Birmingham
	Professor Gerry Doyle Armagh Observatory
	Dr Joel Goldstein Bristol University
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	Professor Max Klein Liverpool University
	Professor Hans Kraus Oxford University
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	Dr Robert Page Liverpool University
	Dr Don Pollacco Queens University, Belfast
	Dr John Richer Cambridge University
	Dr Mark Thomson Cambridge University
	Professor Robertus von Fay-Siebenburgen Sheffield University
	Dr David Waters University College London

SCIENCE IN SOCIETY PANELS

Small Awards Panel

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Members	**Professor Tim Greenshaw** University of Liverpool
	Ms Anita Heward UK Goes to the Planets
	Dr Valerie Jamieson New Scientist
	Dr Marek Kukula Researchers in Residence
	Dr Rosalind Mist Ecsite-UK
	Mrs Becky Parker Simon Langton Boys School
	Ms Helen Reynolds Gosford Hill School
	Dr David Jenkins University of York

Large Awards Panel

Chair	**Professor Mike Edmunds** STFC Council Member
Members	**Dr Chris Davis** STFC Rutherford Apppleton Laboratory
	Professor Mike Green Royal Holloway
	Dr David Moore Tachyon Associates
	Dr Paul Murdin University of Cambridge

Fellowships Panel

Chair	**Professor Mike Edmunds** STFC Council Member
Members	**Mr Colin Johnson** The British Association for the Advancement of Science
	Dr Tara Shears University of Liverpool
	Dr Andrea Sella University College London

Further details about the STFC Council and its advisory committees is available on the STFC website at www.scitech.ac.uk/About/Strat/Council/council.aspx

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