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Exploring & Understanding Science



fascination



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**Science & Technology
Facilities Council**

Innovation special

Maximising the impact of our science and technology for the benefit of the UK and its people is at the core of what we do.

Realising this vision enables us to not only use our research programmes to uncover new scientific knowledge, but to make real differences to both the economy and society, with activities that create jobs and advance technologies to solve a wide range of modern challenges, such as advancing healthcare technologies, creating green energy solutions and making more efficient use of the data and systems open to small industries.

Turning fundamental research into a viable commercial venture is not easy. Many high-impact innovations can, without the right support, fall into the 'Valley of Death' – a term used

to describe the difficulty of turning a commercial idea from the research lab into a marketable product.

STFC supports innovation and bridges this 'Valley of Death' through a range of initiatives including: offering funding schemes; exploiting intellectual property from our own laboratories and facilities; creating opportunities for UK industry to win contracts; and through the national science and innovation campuses at Daresbury and Harwell, which aim to create environments where innovative, high tech companies flourish.

This edition of Fascination gives you a flavour of just some of the ways in which STFC fosters innovation and supports UK industry, large and small.

The sky's no limit for new liquid scanner

What do water, whisky, perfume and sunscreen have in common?

They are just some of the items covered by the current EU ban on liquids over 100ml being carried in air passengers' hand luggage. While boosting safety, it's a ban that's caused a lot of frustration for travellers and airport security staff alike. Now, though, an end to the pain may be in sight, thanks to a revolutionary laser-based scanner developed by STFC spin out Cobalt Light Systems Ltd.

INSIGHT100 can screen a bottle and detect if there is a dangerous material inside in less than five seconds. Its impressive detection capabilities have enabled it to secure European approval, with trials now underway at a number of airports and widespread introduction anticipated possibly as early as next year. What's more, the trail leading to the scanner's arrival in the marketplace has been an object lesson in STFC's ability to turn ingenious upstream technologies into practical downstream products.

The seeds that grew into the INSIGHT100 were first sown nearly a decade ago in our Central Laser Facility with the invention of SORS (Spatially Offset Raman Spectroscopy) – a technique used to identify the chemical composition of sub-layers beneath an object's surface. Taking the technology forward, demonstrating its viability and transforming it into marketable products, took several years of intensive effort and close collaboration between scientists, industry, research councils and funding bodies.

STFC's own proof of concept fund played a key role (available to STFC staff to develop projects with commercial potential using our intellectual property). As did our reputation for groundbreaking innovation, which helped attract backing from NESTA (the National Endowment for Science, Technology and the Arts), the Rainbow Seed Fund (which encourages the development of high-quality research into world class business opportunities) and the Oxford Technology Enterprise Capital Fund, as well as other business angel and venture capital sources.



Cobalt Light Systems itself got up and running at Rutherford Appleton Laboratory in 2008 and has been hard at work ever since, incorporating SORS and its sister technology Transmission Raman Spectroscopy (TRS) into a suite of pioneering high-tech scanners targeting real-world needs in the pharmaceutical industry as well as the security sector. Cobalt Light Systems is a spin out company that can see blue skies ahead.

For more information visit www.coballight.com

One of the ways that we generate innovation impact is through the exploitation of our intellectual property (IP). STFC Innovations Limited, our wholly owned technology transfer company, formally manages this process through the creation of spin outs like Cobalt Light Systems, or through license agreements which allow other organisations to make use of STFC's IP.

Funding schemes *help innovators across the valley*

Many researchers who want to turn their hard work into a marketable product or service fall at the first hurdle, getting the funding needed to take their concept successfully across the 'Valley of Death.'

STFC enables the research we fund at our facilities and in UK universities to be exploited through a range of additional innovation funding schemes which are available at different stages of the journey to market.

- Proof of concept funding – STFC runs an internal proof of concept fund, available to STFC employees only, for projects based on internally developed STFC intellectual property with commercial potential. This can be used to move forward a technology into a license or spin out company.
- Follow on funding – a year's worth of support can be accessed for very early stage development and even market analysis 'following on' from the actual research project itself.
- Innovations Partnership funding (IPS) – as the technology becomes more developed researchers may see benefit in partnering with industry or other academic disciplines. IPS funding enables industry to get involved

at a very early development stage with most of the costs being borne by STFC. This means that although they would be expected to contribute to the development of the idea or technology, there is minimal risk to the commercial partner – something which can often put them off investing in a potentially great commercial concept.

- Challenge Led Applied Systems Programme (CLASP) - STFC is supporting the development of novel ways to combat the grand global challenges of security, energy, environment and healthcare and we are funding large projects in all these areas. For example, Nu Views a project to develop a new type of handheld camera combining gamma ray and optical imaging, particularly suited to intra-operative use.

For more information about STFC's innovation funding schemes visit www.stfc.ac.uk/19205.aspx



Case study: **increasing food safety** *using ozone*

With STFC's support, the University of Glasgow has successfully commercialised a novel method for creating and handling ozone. Their revolutionary development provides an innovative way of sterilising packaged consumer goods.

The project was initially supported through the stages of intellectual property identification and protection by a jointly funded SUPA (Scottish Universities Physics Alliance) and STFC IPS Fellow. The team also secured follow on funding from STFC, proof of concept support from the Glasgow EPSRC funded knowledge transfer account, and a SUPA physical and life sciences fellowship.

Ozone is a highly effective germicidal sterilising agent but its toxicity has hampered its use beyond the classical function of large-scale water sterilisation. However, Glasgow's novel concept is able to use ozone as a decontaminant of material inside sealed packages, by striking a plasma in a thin layer on the inside of the container. This plasma generates ozone, which circulates around the contents which acts as a sterilising germicide.

This approach allows for decontamination, without opening the packaging or compromising the seal. Unused ozone quickly decays back to conventional oxygen, leaving no toxic residues. Since the ozone is created on demand and in situ, there are no storage or environmental problems, making it ideal for deployment on production lines, initially focusing on the food packaging industry – a sector which it is estimated was worth £5.6Bn in 2010.

This effective use of STFC funding has resulted in the development of a new spin out company, Anacail Ltd, with venture capitalists IP Group. Anacail is currently exploring exciting opportunities with several major UK and European businesses.



Case study: **detecting fake whisky** *using space technology*



Researchers at the University of Leicester's Space Research Centre have developed a pioneering method of detecting counterfeit whisky through the bottle using space technology.

Recently recognised at the prestigious iNet Innovation Awards 2011, the application shows huge potential for the food and drink sector and beyond. The Scotch whisky industry estimates that the six leading producers lose more than £500M each year through counterfeit crime. Working with De Montfort University's design department, Leicester researchers are developing a handheld device which can rapidly identify counterfeit whisky, demonstrating great potential to tackle this significant problem.

As well as being an important tool for fighting the war against fake whisky, wine and other high

value drinks products, the technology also has the potential for much wider societal and economic impact in other areas such as airport security and the detection of counterfeit medicines.

The University of Leicester has a strong track record of successful engagement with knowledge transfer activities. In the recent past, this active approach has been complemented by hosting a STFC funded IPS Fellow, Tim Maskell. His role as an IPS Fellow is to identify and develop opportunities for transferring the new technologies from externally funded space related research to industrial partners to the economic benefit of industry, the university and the wider economy. This application into detecting fake whisky is one such example.

Innovations Club

STFC has its own 'Innovations Club' which runs a very active programme of free workshops and events on a range of topics for the benefit of academics, industrialists and other interested research and technology organisations. The Club aims to broker partnerships and encourage collaboration between STFC's researchers and STFC supported international facilities, industry and other academic disciplines.

For further information about the Innovations Club visit www.stfc.ac.uk/19424.aspx

Funding bright ideas through fellowships

Key reasons why a promising innovative idea can fail to move out of the laboratory include a lack of time, funding and experience. A collaborative scheme between STFC and the Royal Society of Edinburgh (RSE) is tackling this challenge head-on through their Enterprise Fellowship scheme for researchers.

The Enterprise Fellowship scheme has been providing business training, knowledge, expertise and a year's salary to would-be entrepreneurs wishing to create a business from STFC research for over ten years. During this time, 11 entrepreneurs have developed innovative, high-tech technologies and businesses.

Dr Alexandre Pechev, who was awarded a Fellowship from October 2010 to September 2011, has used software that was initially designed to help control spacecraft systems, to develop a revolutionary animation software product

which is now being used in major movie productions!

Dr Pechev said: "The Fellowship provided me with fantastic business guidance and expertise as well as the opportunity to concentrate 100 percent on the business. It's definitely helped the company to build new business and develop new products."

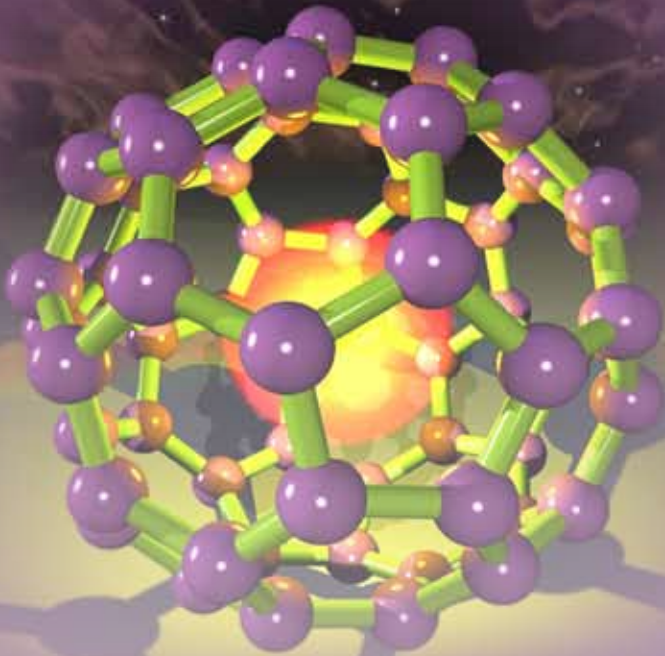
The IKinema technology uses a new algorithm (a set of steps used to solve a mathematical computation) which automatically takes into account the effects of gravity and balance to animate the whole body of any animated character or creature. This allows the software to produce extremely lifelike and natural movements much more quickly than ever before.

This new approach has attracted attention from internationally renowned media groups such as Warner Brothers and 20th Century Fox, who have chosen the innovative technology to improve

their work in big budget movies. Recently, IKinema worked in partnership with visual effects company Framestore on the Hollywood film 'Wrath of the Titans'.

For more information please visit www.royalsoced.org.uk and www.ikinema.com

IKinema worked with visual effects company Framestore on 'Wrath of the Titans'
Credit: Framestore



Fast track access to ISIS for industry R&D

A new £1M fast track programme to widen the use of neutron and muon beams for industrial research is now available at Oxfordshire's ISIS neutron and muon source at the STFC Rutherford Appleton Laboratory.

The aim of the ISIS Collaborative R&D programme is to widen the use of ISIS by industry in order to increase the economic benefit that the facility contributes to the UK.

The new programme has attracted some of the UK's best known names like Rolls-Royce and Johnson Matthey, alongside smaller companies, and also demonstrated the value to companies of being located in the vicinity of world class research centres like STFC.

Neutrons are an invaluable tool box for understanding the properties of materials. ISIS is regularly used by a wide range of industries from pharmaceutical and chemical companies to high-end mechanical engineering in the nuclear and aerospace sectors. The neutron and muon instruments at ISIS provide unique and essential information at the atomic and molecular level.

For example, scientists at global-based science company DSM and the University of Bristol have joined forces through the scheme to improve surface coatings. The research team are using new instrumentation on Target Station 2 to better understand how polymer processing can be optimised to enhance adhesion and layering on surfaces. It is expected that the results will help to improve their properties for use in the information technology and communication industries, amongst others.

Central to the programme is a philosophy of providing the UK industrial community with direct access to the world class instrumentation and world leading expertise available at ISIS and matching that capability to industrial researchers working on technical and scientific problems with high impact in their particular industry.

"The success of the trial programme, which started last year, confirms that UK industry has an appetite and real need for high technology solutions like neutrons to ensure its R&D remains highly competitive," said Dr Christopher Frost, programme manager.

For further information visit www.isis.stfc.ac.uk/apply-for-beamtime

STFC operates several world class research facilities in the UK and provides access to others abroad such as the European Synchrotron Radiation Facility (ESRF) and Institut Laue-Langevin (ILL).

UK industry makes use of these facilities to develop their products and processes working collaboratively with university researchers where they are happy to publish the results of their work and by buying proprietary access where they require research confidentiality.

This forms a critical part of R&D in industry for companies ranging in size from FTSE 100 multinational organisations to SMEs. This provides a unique offering to the UK's industrial community as these world class facilities are beyond the financial reach of any one company or university.

Techniques that underpin industry

STFC supports and underpins several industries and other areas which contribute to the UK economy. Although we cannot take exclusive credit for the establishment or success of these industries, our support role is a distinctive one – we provide unique facilities, technology and training which underpin and are key to certain industries. Without this support, these industries may not have progressed as well or as far as they have.

For example, STFC techniques underpin the pharmaceuticals industry:

- 15 of the world's current 75 best selling drugs were discovered and developed in Britain using techniques pioneered by STFC
- This industry contributes £8Bn to the UK GDP and supports 67,000 jobs

Exciting UK industrial opportunities from the biggest eye on the sky

The European Extremely Large Telescope (E-ELT) to be built in Chile, will be the biggest optical and infrared telescope in the world.

The E-ELT is a €1083M, 11 year construction project which will be designed and manufactured in Europe and constructed in the north of Chile for the European Southern Observatory (ESO).

It will have enormous global impact by enabling astronomers to probe and understand a whole range of phenomena, from Earth-like planets around nearby stars to the origin and development of the most distant galaxies at the edge of our observable Universe.

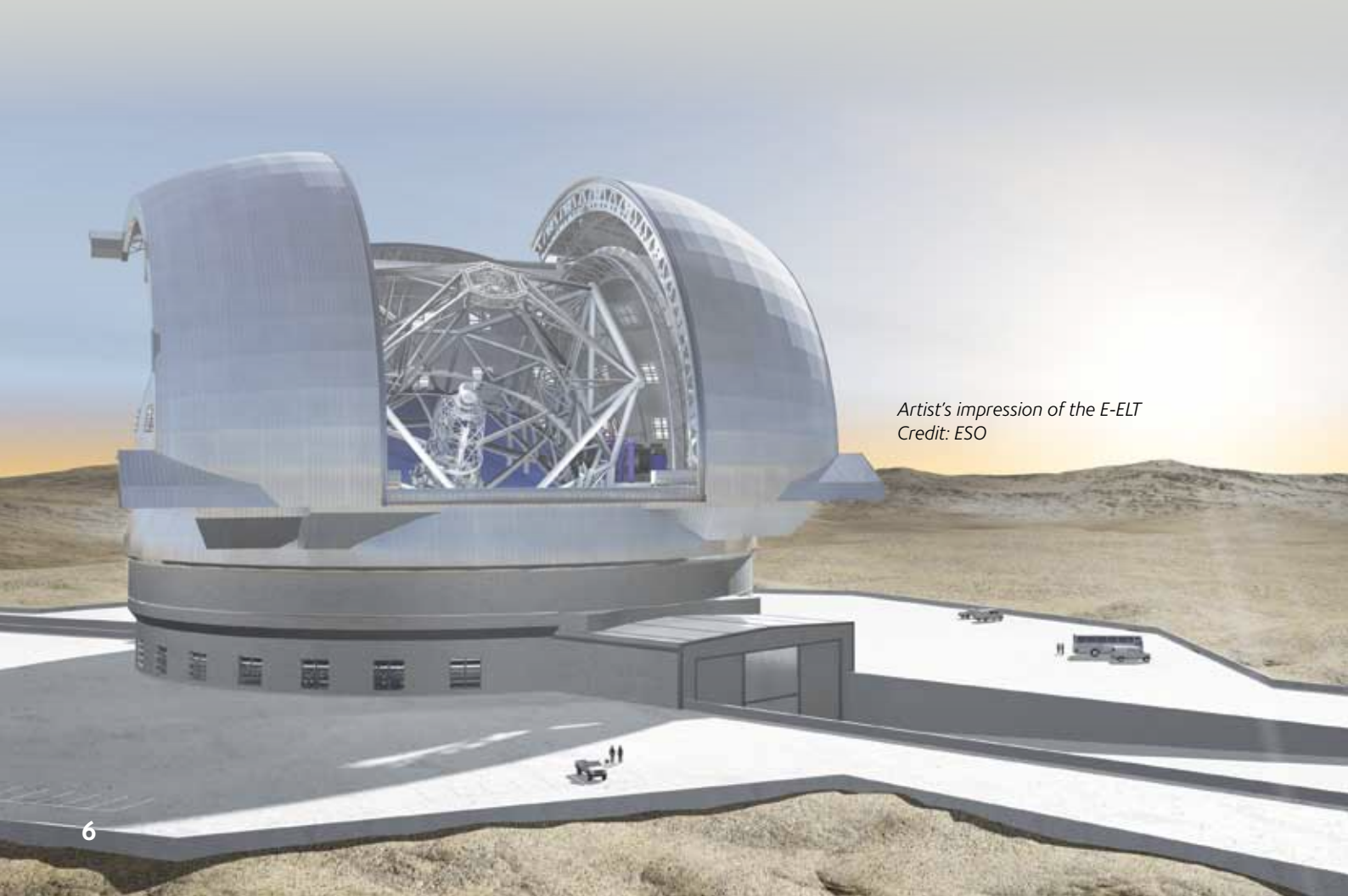
The UK has been playing a leading role in the R&D of the E-ELT, leading the generation of science requirements, developing instrument designs and adaptive optics technologies, designing telescope systems and developing manufacturing processes for the optical elements.

One of the key strategic aims of STFC is to ensure that UK industry wins significant contracts for the construction of the telescope, the telescope facility and its systems and instruments.

Companies that have already benefited from contracts include ARUP, e2v, SciSys Ltd and Observatory Sciences Ltd. Notably a UK consortium based at OpTIC Glyndŵr in North Wales is already among companies which are developing prototypes for the advanced mirror coating that will be required for the huge number of mirror segments in the project. This development is aimed at securing a potential €150M plus order for manufacturing the production segments in UK industry.

The industrial return has already had an impact to UK industry totalling £9M in new contracts and is expected to be into the hundreds of millions of pounds by the end of the project.

For more information, on the E-ELT visit the ESO website www.eso.org. For industrial opportunities contact the UK E-ELT Project Office on 0131 668 8100.



*Artist's impression of the E-ELT
Credit: ESO*

Healthy collaborations at Harwell

The national science and innovation campuses at Daresbury and Harwell Oxford create a critical mass of facilities, skills and businesses. The HealthLinks@Harwell programme on the Harwell Oxford campus is one project which is demonstrating how this concentration of high-tech expertise is enabling academics and industry to work together.

Focused on the healthcare technologies sector, HealthLinks@Harwell uses a combination of events, networking and online tools to encourage and facilitate multi-disciplinary collaborative projects between researchers and industry.

Megan Morys, HealthLinks@Harwell programme manager, explained: "Participants walk into one of our events knowing that everyone there is in the right field and interested in collaborating, so it's a very efficient way of meeting people."

By effectively forming consortia, researchers and industry are in a better position to apply for research and innovation grants from funding bodies such as the Medical Research Council and Arthritis Research UK to take their projects forward.

Ms Morys continued: "Local attendees who regularly go to the events build up a bond of trust and mutual understanding, and

by facilitating the formation of project teams we can help many more collaborations emerge. Once a need or a technology has been identified, it's also easier to draw in potential collaborators from further afield. For example, MRC Harwell, lead partner in the HealthLinks@Harwell programme, is in discussions with a company from the Daresbury Science and Innovation Campus about a breath analyser to detect disease."

With five grant proposals currently under consideration by funding bodies, HealthLinks@Harwell has brought together a range of partners from the campus and beyond to collaborate on new scientific research. Of these five, STFC is a partner in three proposals. We also have a number of projects ongoing through the HealthLinks@Harwell programme, such as a nanotechnology treatment for otitis media or glue ear. This project with MRC Harwell will enable the delivery of drugs directly to the ear rather than systemically, thus avoiding a number of unpleasant side effects and allowing the treatment to be used in children.

For more information about the HealthLinks@Harwell project contact megan.morys@goodman.com

Harwell Oxford fact file:

- There are over 4,500 people employed more than 150 organisations on the campus including Research Councils, start-ups and multinational organisations
- Harwell Oxford is a joint venture between STFC, the UK Atomic Energy Authority and property development company Goodman
- Harwell Oxford is part of the Science Vale UK Enterprise Zone. This is expected to bring high-tech, high-value-adding jobs and generate additional business rates which can be directly reinvested into the Oxfordshire economy



Fertilising budding ventures through business incubation

STFC is establishing an enviable track record in business incubation – a growth-promoting, job-generating approach to helping bright new companies avoid pitfalls that could destroy their dreams.

Taking a promising business concept and turning it into a commercial reality can be far from straightforward. Indeed, coming up with an innovative idea is often the easy part. In the high-tech arena, especially, there's no end to the obstacles that can impede entrepreneurs and derail fledgling companies.

It's a question of expertise, experience and resources. How exactly do you secure funding and attract investment? How can you afford to access the laboratory/office space, experimental equipment and the technical know-how you need to prove concepts and establish credibility? How can you develop the 'soft' skills – in business planning, financial management and marketing – that are critical to developing a robust commercial proposition? No wonder the challenges facing embryonic companies have been dubbed the 'Valley of Death.' Yet in difficult times, these are the businesses that must succeed if the UK economy is to grow sustainably.

Business incubation can be the answer. It involves pinpointing young businesses with potential and, through a range of support, helping them build skills and access not just high-calibre facilities, technical expertise and business advice but also a wide range of contacts that would otherwise remain out of reach. In short, business incubation enables small companies to think big and allows them to retain their intrinsic energy, dynamism and lightness of foot while developing a firm platform for success.

This is a concept that we have embraced wholeheartedly as we act as an engine of

innovation delivering tangible economic and social benefits for the UK. STFC is currently home to three pioneering business incubation initiatives. Two of these, the Innovations Technology Access Centre (I-TAC) and the European Space Agency Business Incubation Centre (ESA BIC), are already producing thriving businesses, new products, new services and new jobs. Now, they are to be complemented by a European Organisation of Nuclear Research (CERN) BIC – the first in Europe.

Incubating businesses, nurturing innovation – STFC is demonstrating the huge potential of a business support model that's proving both imaginative and effective.

For more information about STFC's business incubation initiatives please contact paul.vernon@stfc.ac.uk



I-TAC

Location: Daresbury and Harwell Oxford Science and Innovation Campuses

Date established: 2010

Core concept:

Supported by STFC, I-TAC provides an innovation-centred, collaborative environment ideally suited to start-ups, small and medium sized enterprises (SMEs) and research and development (R&D) teams from established businesses.

Tenants benefit from well-equipped laboratory space (on a long-term lease or short-term 'hot lab' basis), offices, workshops and ready access to STFC's wide-ranging, world-leading expertise and infrastructure. They can also utilise high-specification scientific equipment (e.g. the Hitachi TM 3000 scanning electron microscope – the first of its kind in Europe) and receive assistance in identifying funding opportunities.

I-TAC was named 'Best Service Provider' at the Energy Innovation Awards 2011 and 'Service Provider of the Year' at the Chemicals Northwest Awards 2012.

Fact file:

- Nearly 30 companies supported since 2010
- Over 30 new jobs created in I-TAC companies
- Over £8.5M invested in I-TAC companies by venture capital, private and other sources
- 5 products taken to market, 8 patent applications filed, 2 licensing agreements secured

- 35 people trained in specific specialist skills, the use of cutting-edge equipment etc
- Over 50% of I-TAC tenants have collaborated with each other

Tenants include:

- **Byotrol**, a Manchester-based firm specialising in hygiene products designed to combat viruses and 'superbugs', relocated its R&D division to I-TAC. Major contracts with Tesco and Rentokil are in place and the company won an award for 'Most Innovative Product or Process' at the Chemicals Northwest Awards 2012
- **Arvia Technology Ltd**, specialises in the treatment of contaminated water to reduce water waste and the treatment of stubborn and non-biodegradable radioactive organic wastes. Just received £3.8M of funding from existing investor MTI Partners, new investors Sustainable Technology Investors Limited, Park Walk Advisors and a number of smaller existing shareholders

ESA BIC

Location: Harwell Oxford Science and Innovation Campus

Date established: 2011

Core concept:

Operated by STFC Innovations Limited and one of a network of ESA BICs across Europe, its aim is to help start-ups develop innovative products and services from space technology that can meet the needs of non-space markets. As well as locating in an open, high-tech innovation environment, tenants receive a support package comprising: a £41,500 grant for development of products, prototyping, intellectual property etc.; modern office space; free access to on-site STFC and ESA expertise; and support in producing business plans and the development of other 'soft' skills.

Fact file:

- Achieved target to attract 10 companies within its first year of operation

Tenants include:

- **Radius Health**, is developing portable X-ray machines for use, for example, at accident scenes. It won a €30,000 Civica European Venture Contest award in 2011 in recognition of its potential contribution to Europe's competitiveness and growth

STFC Chief Executive John Womersley and CERN's Director of Accelerators and Technology Steve Myers announce plans to create a CERN BIC at the Daresbury Science and Innovation Campus

CERN BIC

Location: Daresbury Science and Innovation Campus

Date established: to be launched 2012 (pilot scheme)

Core concept:

Focusing on businesses developing market applications from innovative technologies related to high-energy physics, this BIC represents a potentially valuable spin-off from the UK's ongoing investment in CERN activities, and will further strengthen Daresbury's reputation as a centre of innovation. Tenants will receive a £40,000 grant plus 40 hours free access to STFC and CERN expertise, including preferential access to CERN intellectual property.

Fact file:

- Up to 5 companies per year will be selected as tenants from those applying to the process



A home for life

Using its blend of open innovation, world-class facilities and collaborative opportunities, the Daresbury Science and Innovation Campus (Daresbury SIC) in Cheshire has created a buzzing and highly innovative community.



Like the Harwell Oxford campus in Oxfordshire, Daresbury SIC is successfully bringing the best research scientists together with high-tech businesses - from entrepreneurs with bright ideas to multi-million pound blue-chips - to collaborate and exploit commercial opportunities in new technologies.

The campus' 'home for life' philosophy has helped make it a magnet for over 100 SMEs across a range of high-tech and scientific sectors including digital/information and communication technology, healthcare, advanced engineering and energy/environment.

The affordability and availability of suitable business accommodation for early stage technology businesses can be an important factor in their growth. In a SME's journey from one or two people with an idea, through to a viable, successful company with tens or hundreds of employees, a different package of accommodation and business support is needed.

SMEs are able to join the high-tech community through the Daresbury Innovation Centre or STFC's Innovations Technology Access Centre (I-TAC) and then stay at the campus as their business

expands by moving into grow-on facility Vanguard House. The opportunity to stay at the campus, coupled with access to business support and STFC's world class expertise offers a significant advantage to growing businesses, often enabling them to use their precious investment capital in more efficient ways.

One company which has benefited from this 'home for life' approach is bug-battling firm Byotrol. Manchester-based Byotrol relocated its entire R&D division from Germany to I-TAC and its consumer products division to the Daresbury Innovation Centre in 2009. This enabled them to develop and enhance their patented technology which combats the spread of viruses and superbugs including MRSA.

Being located on campus provided Byotrol with access to specialist expertise and laboratory facilities that enabled the successful launch a number of co-branded consumer products, including an anti-microbial cleaning spray for Tesco. These breakthroughs have seen Byotrol grow significantly. By taking space in Vanguard House in October 2011, the company has been able to consolidate its commercial activities, collaborate with other

campus companies with complementary technologies and continue taking advantage of its close location to I-TAC.

Gary Millar, Byotrol's Chief Executive said: "Integral to the Byotrol vision is our investment and commitment to the future of our technology and our move to the Daresbury campus has been a key part of this. Connecting our technical development team with our commercial departments at Daresbury has enabled the company to be completely integrated and focussed in achieving our goals."

Professor John Womersley, Chief Executive of STFC added: "Daresbury represents a concentration of the three core ingredients needed for true innovation: brilliance in science, globally leading facilities and entrepreneurial 'can-do.' This mix only works when there is open innovation with scientists from universities across the country, STFC's own scientists, working with entrepreneurs and investors to drive the application and commercialisation of new discoveries."

For more information about the national science and innovation campuses please contact andrew.bennett@stfc.ac.uk

Daresbury SIC fact file:

- The campus is a joint venture between STFC, Halton Borough Council and developer Langtree
- The campus is home to more than 900 people including entrepreneurs in over 100 high-tech businesses and world class scientists at STFC's Daresbury Laboratory and the Cockcroft Institute (a national centre for accelerator science)
- The campus is part of the SCI-TECH Enterprise Zone. Enterprise Zone status will allow business rates to be reinvested into the campus to provide important new support infrastructure and also specialist office, laboratory and technical space



Doing business with **big science**

Facilitating academic and industrial access to large-scale international research facilities is one of the ways in which STFC supports the generation of new skills, ideas and technologies whilst contributing to economic growth.

Through STFC, the UK is a major contributor to state of the art research facilities such as the European Organisation for Nuclear Research (CERN), the European Synchrotron Radiation Facility (ESRF), Institute Laue-Langevin (ILL) and the European Southern Observatory (ESO).

The funding needed to build and maintain any of these facilities would be beyond the reach of any single member-state country. By collaborating together and paying annual subscriptions, researchers from member states across Europe can access the very best scientific facilities.

STFC's External Innovations Team plays a key role in ensuring that the UK sees a return on this crucial scientific and economic investment, by supporting UK companies to engage with the facilities. There are a wide range of diverse and lucrative business opportunities available to UK companies, including contracts to supply products and services ranging from technological developments to help expand the boundaries of current scientific knowledge, to providing key support infrastructure such as air conditioning.

The team gives companies advance warning of upcoming tenders from the

international facilities, provides advice on the tenders process and support for any companies wishing to respond. They also organise targeted 'Meet the Buyer' events throughout the year which link companies with procurement specialists and technical staff from the facilities. These events provide important opportunities for companies to have direct interaction with their potential clients, providing an opening for future collaborations and information exchange.

For more information visit www.stfc.ac.uk/19375.aspx

Spotlight: UK industry and CERN

Through STFC's annual subscription to CERN in Geneva, we are one of its biggest investors contributing approximately 15% of our annual budget into projects such as the Large Hadron Collider.

In 2011, CERN spent over £180M on industrial service and supply contracts within its 20 member states, of which UK companies won £10M worth of contracts. Over the past three years the return to the UK from CERN has increased steadily, with contracts for UK supplies up by 40%, whilst contracts for UK services have increased six-fold.

The UK is particularly good at winning contracts in electrical engineering and energy and also computer systems and communication, which in 2010 represented 12% and 39% of all UK supply contracts.

Early efforts to win contracts from CERN can result in the company being recognised as a preferred supplier of particular

products or services, increasing the opportunity to win repeat business. It can also help them build their reputation as a supplier of key products and services to win new business elsewhere. For example, UK firm Hireserve have developed software package called iCams that is used by CERN for recruitment purposes.

Hireserve's contract with CERN encouraged them to further develop their product, and this is now used by a number of different companies, including some in Geneva. CERN currently receives around 300 applications for some of its vacancies. They are now co-funding work with Hireserve to develop software to look at handling high volume submissions, which will have long term benefits to the company.

For more information about CERN visit www.cern.ch. Find out more about Hireserve at www.hireserve.com

STFC also collaborates with UK companies on technically demanding projects. This allows them to go on to build their expertise and go on to win more business from other companies. For example, we have continued to collaborate with e2v on a range of space projects, helping them to build their own skills and expertise which has enabled them to win £300M of contracts.



e-Infrastructure – powering growth and innovation

For a thriving, innovative knowledge economy, e-Infrastructure – the computing networks, systems and software that underpin our world-leading research – is essential in enabling both scientists and businesses to make important breakthroughs.

Data generation and analysis using computational methods is now at the heart of modern science.

Everything in our world can be taken back to its raw data – from the food we eat, medicines we take to improve our health, our ability to predict extreme weather events, to the software that controls traffic lights to enable vehicles to travel safely.

Last year government announced an additional investment of £145M in the UK's e-Infrastructure to improve computing, software development, data storage, networking and distributed computing networks. From this, STFC was awarded £49M to fund, and host for other institutions, a range of high performance computing (HPC) and e-Science projects that are designed to improve the UK's existing facilities and provide a sharper focus on working with industrial and other government department users.

Working in collaboration with industry is vital to harness innovation and increase the UK's global competitiveness. We are world-leaders in aerospace, defence, high performance cars and pharmaceuticals. These are sectors which require significant levels of R&D, which need to continually enhance the performance of products and reduce the time to market to keep their competitive advantage.

As a result of this, there has been a paradigm shift. Science and innovation

are beginning in the virtual world of modelling and simulation using supercomputers before moving to the real world of the laboratory. An IDC Corp report to the European Commission estimates that successfully exploiting these techniques could increase the GDP of European countries by 2-3 per cent within 10 years. In today's figures this translates into around £25Bn per year in additional revenue to UK Treasury and more than half a million UK based, high-value jobs!

By undertaking new product R&D in this way, businesses can reduce their costs, their time to market, and gain competitive advantage by understanding their product features and materials in greater detail.

This creates challenges which are also faced in scientific research: being bombarded with huge amounts of data and at a much faster pace. This data is meaningless without being able to interpret it and use it as information.

One of the ways in which STFC is addressing these challenges and developing the UK's e-Infrastructure is through its International Centre of Excellence for Computational Science and Engineering (ICE-CSE) at Daresbury Laboratory.



ICE-CSE brings together academic, government and industry communities to focus on multi-disciplinary, multi-scale, efficient and effective computation. Working in collaboration with IBM using their most advanced hardware systems, and with others, the ICE-CSE will have one of the top 10 supercomputers in the world with the performance of 1.4 petabytes (this is the equivalent of around one million iPods).

Its focus is on software development, particularly that which is industry-led. It will provide the ability to simulate very complex systems, such as mapping the human brain or modelling the Earth's climate - the data from which would overwhelm even today's most powerful supercomputer.

At the moment the cycle for producing new software to run on supercomputers is about 10 years, compared to just two years for hardware. This prevents researchers and businesses of all sizes from exploiting supercomputers effectively. The ICE-CSE will focus on bridging the gap between hardware

and software, bringing a step change in the UK's ability to address key challenges and deliver new breakthroughs in science. For example, finding cures for serious diseases or significantly improving the prediction of natural disasters such as earthquakes and floods.

Stephen Leonard, Chief Executive of IBM UK and Ireland said: "The challenge facing many industries is to understand how to use the power of supercomputers. The IBM collaboration with STFC will give UK industry exceptional access to world class researchers to help unlock the potential of HPC as we look to solve key technical challenges faced by a broad range of sectors. By making HPC easier to use and more directly accessible to these industries, they will become more innovative and competitive. This will drive a rebalancing of the economy and an increase in revenue to the UK Treasury."

Big industry is no stranger to harnessing the power of supercomputers. Unilever has been working with STFC's computational scientists since 2009 to develop special software tools that can predict how the different ingredients will interact with each other as part of their new product development.

For more information about e-Infrastructure or the ICE-CSE contact john.bancroft@stfc.ac.uk

The government awarded STFC with £49M to invest in e-Infrastructure:

- Software - £30M – ICE-CSE for the demonstration and development of HPC systems (in addition to £7.5M capital already allocated)
- Networks - £3M – GRID PP
- Data storage - £2M – e-Science and DiRAC
- Compute - £14M – DiRAC (particle physics QCD and cosmology)
- Collaborations - STFC will also host the £4.5M NERC climate change modelling centre and a system for a consortium of universities (Oxford, Southampton, Bristol and University College London) funded by EPSRC (£3.7M)

Supporting new and existing markets

STFC has a good track record of developing technology from which new markets emerge. We have played a key role in the development of the World Wide Web, medical imaging and computer animation technology. Together, these technologies underpin the digital economy in the UK which contributes £125Bn to the UK GDP per annum.

Here's what else has been happening at STFC recently...

LHC in London



The world's largest science experiment was showcased in central London during National Science and Engineering Week in March to highlight the UK's role as a world leader in research and innovation.

STFC transformed the window of the Department for Business, Innovation and Skills' Westminster office into a giant mural of the Large Hadron Collider (LHC) and constructed a

special exhibition in the entrance foyer. Around 8,000 people were able to appreciate the scale, complexity and inspirational nature of the experiment.

To enable as many people as possible to see the display, it will now be visiting festivals and attractions across the UK.

LHC tour dates:

- 15–17 June - Cheltenham Science Festival, Cheltenham Town Hall
- 23–24 June - JodRock – Jodrell Bank, Manchester
- 28–30 June - Lancashire Science Festival, University of Central Lancashire
- 12–13 July - Central Hall, Lecture Theatre and Library, Westminster
- 9–12 August - Bristol Balloon Festival – Ashton Court Estate, Bristol
- 3–7 September - Upper Waiting Hall, Houses of Parliament, London
- 30 September - Daresbury Mini Festival, Daresbury Laboratory, Cheshire



Programmatic Review 2012-2013

The STFC programme will be reviewed from June 2012 to September 2013 (planned reporting date) by Science Board.

The Programmatic Review ensures that the UK remains at the forefront of the science we support by considering regularly the quality, effectiveness and impact of our programme. The 2012-13 review will build on the processes and lessons of the 2009 and earlier reviews.

The Programmatic Review will ensure that funded activities continue to meet our strategy. It will inform our strategic and financial planning and recommend a future research portfolio.

This ensures there is capacity and flexibility to take advantage of strategically important future opportunities.

This review will consider all aspects of the STFC programme including grant funded research, laboratory departments, facilities and the impact programmes (for example, the Public Engagement and Futures programmes).

Community input is vital and will include working with the Advisory Panels on updates to the roadmaps and project /facility information. We will provide regular updates on how the review will be conducted and which activities will be reviewed in which ways, so please visit the website for updates at www.stfc.ac.uk/38859.aspx

STFC takes the silver

STFC's commitment to the professional development of its employees has been acknowledged with the achievement of the Investors in People (IIP) Silver Award - putting it in the top 5% of the 22,000 accredited organisations in the UK!

The review, which took place in October 2011, is a valuable measure of STFC's performance as it is based on employees' direct feedback about the organisation rather than a paper-review of its policies and processes.

The IIP Standard is a nationally recognised benchmark of good practice. Organisations can choose to meet the basic standard or go beyond it to achieve either bronze, silver or gold to get a higher level of accreditation.

STFC's Chief Executive, Professor John Womersley said: "STFC employees are talented, passionate and dedicated to working on and supporting world-leading science – something which hasn't gone unnoticed by the IIP assessors during this and previous reviews. We are delighted to achieve the Silver Award as this acknowledges the strategic importance which we place on the development of our people and the excellent progress that we



have made since our last review in 2008. Our aim is now to go for gold. We will be working with our employees to make further improvements in a number of areas, such as embedding our organisational values and improving our management capability, to make this aspiration a reality. Our staff are the key to ensuring that STFC continues to make a significant contribution towards maintaining the UK's position as a leading knowledge economy."

Inspiring science rolls around schools

Secondary school students in the north west of England are being inspired by physics experiments coming to their schools this summer.

Lab in a Lorry is a mobile physics lab, run by the Institute of Physics (IOP) and supported for this tour by STFC. It is designed to inspire the next generation of scientists and engineers, offering 11-14 year olds the opportunity to explore science through specially created interactive experiments. The lorry aims to reach 6,000 students across the region, from Alsager in the south to Carlisle in the north, all of whom will be introduced to key concepts in physics and their application.

The experiments on board the lorry involve using the properties of light to diagnose sick patients, using sound waves to smash wine glasses, and scattering light to understand why the sky is blue and help identify the real colour of the Sun. The key concepts behind the experiments are illustrated with examples from everyday life and cutting-edge research including how X-ray

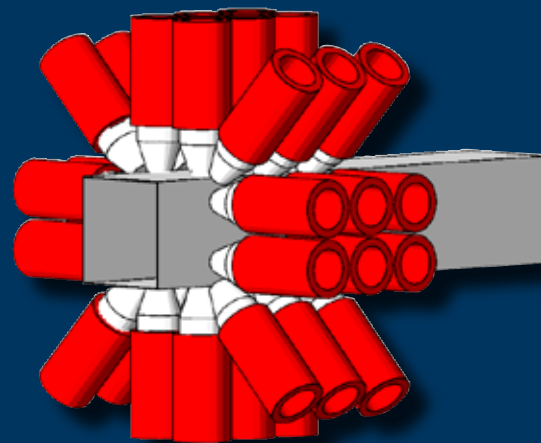
diffraction led to tastier chocolate, the role of resonance in MRI scanners and pre-launch satellite testing, and how the properties of light help data transfer from experiments at CERN.

One Year 10 student said: "It was good to be able to use advanced equipment and I found it really interesting to learn more about light and the effects it has around us." STFC project manager Tony Buckley commented: "We're using the compelling gateway subjects STFC supports and our inspirational 'Big Science' facilities to illustrate basic science concepts in the Lorry and allow their extension in the classroom. This is helping inspire young people to choose to study science at every level so that they can become the informed citizens of the future and the skilled workers that will grow the knowledge economy."

Find out more at www.labinalorry.org.uk



A microscope for the most exotic



*A simulation drawing of the detector array
Credit: University of Brighton*

When dense regions at the centre of atoms (atomic nuclei) decay, they emit unique fingerprints of radiation according to their make-up of neutrons to protons. Radiation can be manipulated to both detect and treat cancer (through medical scanners).

Boundaries are constantly pushed; arrangements of protons and neutrons altered, and resulting radiation examined. This furthers understanding of how nuclei heavier than iron were created and how radiation can be used in medical scans.

A state of the art nuclear microscope led by an STFC-funded consortium will allow for the first time, the internal structure of the most exotic nuclei (an arrangement of protons and neutrons on the edge of what is possible), to be examined.

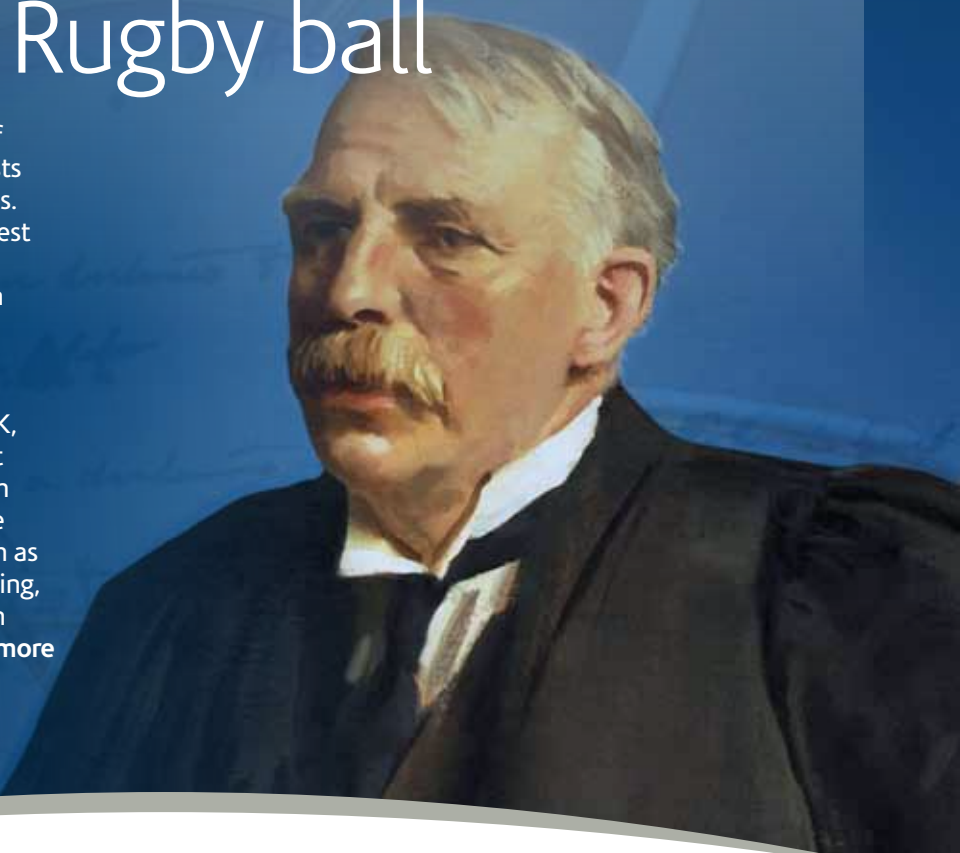
The array of detectors is being developed for the NUSTAR (Nuclear Structure, Astrophysics and Reactions) collaboration, part of the billion-Euro accelerator facility, FAIR (Facility for Antiprotons and Ions Research) being constructed at Germany's GSI.

NUSTAR experiments will collide uranium to form nuclei created in Supernovas (exploding stars) that often survive for only a fraction of a second afterwards. It is a new material (made from the compound Lanthanum-tri-bromide) used in the array, that will allow the time difference between two gamma rays to be isolated to within fractions of a billionth of a second, meaning exotic nuclei can be examined with unprecedented accuracy.

'Exciting' tackle reveals Ernest Rutherford's Rugby ball

On the 100th anniversary of the discovery of the nucleus at the heart of the atom, scientists have discovered a 'rugby ball' shaped nucleus. Rutherfordium, the element named after Ernest Rutherford who discovered the existence of the nucleus, has one of the heaviest nuclei in existence. This study helps nuclear scientists tackle one of the fundamental questions... how many elements are there?

A collaboration of researchers from the UK, France and Finland performed an experiment to produce and study Rutherfordium in a high energy, or excited state for the first time. The pattern of photons emitted by Rutherfordium as it decays, takes the shape of a rugby ball, fitting, as it is believed Ernest Rutherford was a keen university rugby player himself. **To find out more about the rugby shaped nucleus visit www.stfc.ac.uk/38655.aspx**



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