The Great IoT Take-off

£50,000 STFC Hartree Centre Competition for UK SMEs

SMEs have the chance to win up to £25,000 each in 'Proof of Principle' voucher prizes to help them unlock the business opportunities offered by the Internet of Things (IoT).

The IoT is one of the fastest moving, most enthralling fields in technology today. Collecting, exchanging, analysing and exploiting data through networks incorporating all kinds of sensor- and internet-enabled devices and objects, it offers huge potential to boost business – and not just for companies harnessing the technologies but for those supplying them too.

Through 'Proof of Principle' vouchers redeemable against the knowledge, facilities and resources of the STFC Hartree Centre – an acknowledged centre of excellence in the development, testing and application of IoT technologies – this competition offers SMEs an outstanding chance to drive maturing projects forward by utilising world class data specialists and technical experts.

- If you've developed a device with potential for IoT workflows to be built around it; or
- If you need expert analysis of data streams generated by an existing sensor network; or
- If your early stage IoT-compatible device now requires the next stage of development…

...then all you need to do is complete the application form and submit it to us by Friday 20th November 2015.
Winning one of the prizes could represent the perfect way to accelerate a sound business idea that contributes to the IoT’s continued evolution and the transformational benefits it offers in terms of efficiency, productivity and business growth.

For SMEs active in this space, the Hartree Centre represents the ideal collaborator, with its creative and productive sandbox environment and extensive range of tried and tested skills in spheres such as device development, sensor build/deployment, workflows and data analytics.

**Key application criteria include the following:**

- Your business should comprise fewer than 250 people.
- Your proposed project should have clear business objectives and growth potential, should dovetail with STFC’s fields of expertise and interest, and should already have progressed beyond proof-of-concept stage.
- You need to be able to come to the Hartree Centre in Daresbury, Cheshire (on a part-time/as necessary basis) to undertake the work and related project meetings.
- Projects must be commissioned and completed by 31st March 2016.
- The production of a case study with the Hartree Centre following the project.

The voucher scheme is subject to special terms and conditions that differ from STFC’s standard terms and conditions for contracted work – [see here for details](#). The intention is that the voucher holder will own and is free to use the IP arising from the project funded by the voucher – with the exception of the IP that relates to improvements of STFC’s background IP and operation of its facilities.
Brand new opportunity for international Post-Docs at STFC and Diamond

STFC and Diamond Light Source are offering 36 positions to post-doctoral researchers over the next five years as part of the brand new Rutherford International Fellowship Programme. The scheme which is being offered in a wide range of scientific disciplines is a result of 2.5M Euro funding from the European Union’s Horizon 2020 programme.

The opportunity, which aims to develop the next generation of leading researchers, offers the chance to work in areas ranging from chemistry to condensed matter physics. The Programme is designed to attract the highest-quality researchers who will be able to take advantage of the world-class facilities and departments across STFC.

Fellowships can be undertaken at any of STFC’s UK laboratories, whether at the Rutherford or Daresbury Laboratories in Oxfordshire or Cheshire, at the UK Astronomy Technology Centre in Edinburgh, or at Diamond Light Source.
Programme Co-ordinator Philip King said “There are a whole host of opportunities available, from placements in our ISIS neutron and muon source at the Rutherford Appleton Laboratory, to space projects at UK Astronomy Technology Centre in Edinburgh. The programme is a great opportunity for researchers from outside of the UK, or those returning to the UK, to work at STFC facilities. In turn it gives our departments the chance to collaborate with some very strong, early-career scientists.”

The current call for Fellowship applications closes on 31 October 2015. Full details including the range of research areas available can be found here: Rutherford International Fellowship Programme

The Rutherford International Fellowship Programme has received funding from the European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 665593 awarded to the Science and Technology Facilities Council.
Materials for demanding environments

Innovate UK is to invest up to £2 million in technical feasibility studies to explore improving the performance of materials in demanding, extreme and/or aggressive environments.

This competition aims to demonstrate radical or novel improvements in the performance of materials in demanding environments. We are seeking proposals that support early stage projects that demonstrate emerging technologies in advanced materials.

Projects must be led by a business and be collaborative, involving a partner with a future route to market.

Small businesses could receive up to 70% of their eligible project costs, medium-sized businesses 60% and large businesses 50%.

We expect projects to last 6 to 12 months and range in size from total costs of £100,000 to £150,000, although we may consider projects outside this range.

This competition opens on 12 October 2015 and the deadline for applications is at noon on 25 November 2015.

Supporting documents & links

Full competition brief
Competition guidance

Scope

The aim of this competition is to demonstrate a novel or radical improvement in materials' operational performance and reliability in demanding environments. These demanding environments may include (but are not limited to) one or more of the following:

- high or low temperature and/or temperature cycling
- abrasive conditions
- high or low pressure
- high corrosion and/or erosion
- highly ionising/high radiation
- high electromagnetic radiation
- high blast
- excessloadbearing
- highimpact
- excessivewear
- high/extended lifetimes
- fire/highoxidation
There are no limits to the location of the demanding environment. It can include both manufactured/constructed products and biological systems (such as in the human body). Again, the following list is not exhaustive, but application areas might include one or more of the following:

- the built environment and construction
- transport, including land, sea and aerospace
- energy, including both renewables and fossil fuels
- space
- biological systems

The materials technologies themselves might include one or more of the following:

- novel nano materials applications
- ceramics with improved thermal shock
- metals and intermetallics for enhanced high-temperature operation
- high-performance polymers
- composite materials
- anti-corrosion coatings
- joining of dissimilar materials
- smart materials

The aim of this competition is to support early-stage projects that demonstrate emerging technologies in advanced materials. We expect that these materials will be able to deliver enhanced performance at a larger scale than is currently the case. We also anticipate that successful new technologies will continue through a validation phase after the completion of the project and be further developed to a higher Technology Readiness Level (TRL). Projects should deliver a tangible outcome, such as a small-scale demonstration of the technology.

Out of scope

The scope of this competition does not include materials that can already be embedded into products, the development of new material manufacturing technologies, or process optimisation projects.

Support phone number: 0300 321 4357

Registration is required to enter this competition. Please note that registration will close 1 week before the competition application deadline.

Register & Apply
Solar powered irrigation pump

The Department for International Development (DFID) leads the UK’s work to end extreme poverty, ending the need for aid by creating jobs, unlocking the potential of girls and women and helping to save lives when humanitarian emergencies hit.

The aim of the competition is to develop an affordable solar-powered irrigation pump that can be deployed to developing regions around the world, particularly Sub-Saharan Africa.

Soil moisture, usually enabled by irrigation, is one of the key drivers of agricultural productivity. Studies have found that irrigation can lead to substantial increases in productivity from 50% (IFPRI, 2010) to over 100% (Molden, 2007). However, despite the availability of groundwater, most African smallholder farmers do not have the economic wherewithal to access the water because pumps and other irrigation equipment are too expensive.

Currently available manual (e.g., treadle) pumps are quite labour intensive, and often not suited for the needs of women farmers. Motorized pumps currently on the market are expensive and require diesel, the cumulative costs of which are high (even though incremental costs might be low). In remote areas, the paucity of distribution networks for diesel is an additional constraint.

The lack of cost effective irrigation solutions has prevented the demonstrating of the benefits of irrigation at a large scale. Existing solutions are not appropriate, reducing demand. However, there is a demand for increased agricultural productivity to meet the food needs of a growing population which will feed through to demand for appropriate solutions. This has also been identified as a critical technological advance needed for sustainable development by the Institute for Globally Transformative Technologies.

A successful outcome would be a prototype that delivers significant improvements in terms of cost, energy requirements and volume of water delivered when compared to existing irrigation solutions.
Target requirements for the device are:

2. Light weight.
3. Lift: 7m
4. Volume: 6m³/day.
5. Ability to be integrated into existing irrigation systems and cope with dirty water.
6. Easy to deploy and operate safely with no specialist skills.
7. Output proportional to sunlight available with some capability in light cloud.
8. Robust design able to withstand the extremes of climate throughout Africa.
9. Easily maintainable when deployed

Applicants must provide technical details of the device and how it meets all of the above targets in their application, including repair costs. The volume production cost is the sum of costs of all resources consumed in the process of making the system including direct materials cost, direct labour cost and manufacturing overhead for high volume production, together with any proposed licensing costs.

DFID is working through SBRI to deliver development outcomes. Therefore, from the outset, applicants need to consider their route to market in Africa. If the applicant does not intend to market directly in Africa licencing or partnership could be considered.

The call will close on Thursday 9th December 2015 at 1200 hrs. All proposals must be submitted via the Innovate UK portal.

Application process & supporting downloads

Competition brief
Competition guidance

Registration is required to enter this competition. Please note that registration will close 1 week before the competition application deadline.

Register & Apply
e-mail: support@innovateuk.gov.uk
Call: 0300 321 4357
"Working with Universities to Deliver Business Benefit" Workshop

This workshop is for R&D managers in SMEs who want to understand how partnering effectively with the UK’s world-leading academic research institutions can achieve improved business results.

The London-based one-day workshop on 1 March features interactive sessions covering:

• why work with a university and why universities want to work with you
• models of working with universities
• finding the right university partner
• reconciling cultural differences to mutual benefit
• overcoming common challenges
• successful approaches to university-business collaboration

The workshop will begin at 09.30 and is followed from 15.30-18.30 by a networking session and university showcase, with technology transfer directors and university Business Development Managers on hand to facilitate direct connections.

To register your interest please email nicky.warnock@praxisunico.org.uk

The Dowling Review highlighted that SMEs that are coming to collaborations for the first time or have limited experience of collaboration are likely to find the process daunting and confusing.

PraxisUnico is working with HEFCE to make that process less daunting, to provide SMEs with practical support to help them get the most out of collaborative work with HEs. PraxisUnico is a world-leading national professional association for public sector knowledge exchange and commercialisation practitioners. This is part of HEFCE’s approach to implementing the recommendations of the Dowling Review focussed on two areas:

• Explore whether more businesses could become engaged with universities to mutual benefit
• Exploring barriers and perceived barriers to university-business engagement, including the role of Tech Transfer and Knowledge Exchange Offices and the contracting process

Events such as this workshop help SMEs establish relationships with the universities, to support growth and successful knowledge exchange.
The UK is one of the most energy secure countries in the world but to support economic prosperity it will rely upon clean, secure and affordable energy supplies.

Energy supply and consumption have evolved radically over recent decades. There has been significant reductions in the amount of energy generated from fossil fuels, particularly coal, in light of the concerns surrounding climate change. The UK is more reliant on imported fuel sources and with increasing global instability, domestic capability must be improved. Natural gas and renewables have increasingly contributed to the energy mix and despite the North Sea reserves becoming depleted DECC believes this will remain the case in the short term. The department does however expect renewables to be the largest energy source in electricity generation by 2030, representing 40% of the overall mix. The current government are keen to exploit the UK’s reserves of shale gas however this contentious issue has yet to be decided and where it will feature in the future energy make up remains to be seen.

At Energy Security and Sustainability an agenda of expert speakers will explore how the UK will be powered in the future whilst ensuring affordability, mitigating climate change and supporting a growing economy. This delegate focused event will maximise plenary and networking time allowing for extensive discussion and debate. Interactive question and answer sessions will give delegates the opportunity to listen, digest, debate and then reflect on information that will shape future energy and climate change policy.

Book now
Telephone: (0161) 376 9007
A company using British-developed science to improve airport security systems has been named one of Britain’s most innovative companies.

Cobalt Light Systems won the Innovate UK’s inaugural Innovation Award for its scanning technology that detects the chemical contents of passengers’ unopened containers to prevent potentially explosive materials being smuggled onto aircraft.

The scanners use technology devised and patented at the Science and Technology Facilities Council’s (STFC) Central Laser Facility.

Cobalt’s Chief Operating Officer, Craig Tombling said: “We’re extremely pleased to receive this award. It symbolises how targeted funding from Government to SMEs can contribute to world-beating technology and innovation.”

Since its inception in 2008 Cobalt has received support and funding from the Government and from STFC to develop a prototype of its liquid scanner. The result was the Insight100, which can detect dangerous chemicals in unopened containers within a few seconds. The Insight100 is now installed in more than 70 airports in the UK and across Europe, with further deployments in Australia and South Korea.

Backed by further funding from Innovate UK, Cobalt is now about to launch the Insight200M, a more compact system with improved sensitivity. Insight200M has already met European aviation standards (ECAC Standard 3) and it has been designed to address the stringent environmental regulations and detection capabilities required for export to the US and worldwide.

Professor Pavel Matousek from STFC’s Central Laser Facility developed the original concept, known as Spatially Offset Raman Spectroscopy. He said: “Cobalt’s innovative products have gone from strength to strength and I’m really pleased that its latest product has been recognised once again as a leading innovation. It’s also gratifying from a personal viewpoint to see our early scientific work at STFC producing technology that is both versatile and effective in addressing some of the many grand challenges we face today.”

Over the past two years Cobalt Light Systems has doubled the number of people it employs, from 21 to 42, and uses a network of distributors across Europe who are trained to sell and distribute the scanners. As a consequence, Cobalt achieved a 5-fold growth in revenue between 2013 and 2014.

Presenting the prize at the Houses of Parliament, Minister of State for Universities and Science Jo Johnson praised Cobalt’s rapid growth and development of products. He said: “It’s good to know that Cobalt’s airport scanners are keeping people safe around the world.”
Innovations Newsletter

A spin-out from Oxford’s Department of Engineering Science has raised £1 million from a high net worth Chinese investor to develop an imaging technology which could help doctors detect cancers, particularly prostate and liver tumours. Early diagnosis of cancer has been shown to save lives, and the Oxford technology will allow for improved visualisation of tumours for earlier detection.

The company – Oxford Enhanced Medical Limited (OxEML) – has been set up with support from Isis Innovation, the University’s commercialisation company, based on technology invented by Professor David Edwards and Professor Chris Stevens. The investor, Mr Zhang was a VP of Hisun-Pfizer Pharma, China. He played a key role in building the company to over 2500 employees and revenues of $850M USD.

Professor Edwards said: “At the moment many doctors have limited access to expensive MRI diagnostic technology. Our approach would enable them to potentially identify and therefore treat common cancers earlier by bringing a new imaging and tissue characterisation technique to clinicians.

OxEML CEO Amol Karnick said: “The OxEML system can also be used by physicians to improve biopsy targeting, making testing and treatment shorter and more effective, and to monitor patients to determine whether treatment is working.”

The investor, Mr Zhang said: “Oxford Enhanced Medical Limited directly addresses a global $13 billion medical imaging market and has the potential to be applied in several non-medical imaging applications. We are delighted to support and be a part of this exciting new venture from Oxford.”

Isis Innovation Deputy Head of Technology Transfer Dr Rakesh Roshan said: “We have been able to bring together a truly multinational group of partners and investors to accelerate the development of this very clever and promising technology.”

The diagnostic power of OxEML-equipped ultrasound machines will address an unmet clinical need and deliver overall treatment cost savings leading to widespread clinical adoption. OxEML will continue to work with its existing partner, Canada’s Centre for Imaging Technology Commercialization, to develop and test its ultrasound imaging technology.

OxEML holds patents which have been granted in several territories including US, China and Japan.
Super-fast laser technique helping target cancer

British scientists are using super-fast lasers to help develop new anti-cancer treatments.

Using lasers to take pictures of a process that occurs in half a billionth of a second, the scientists are observing how a light-activated compound alters the structure of DNA. This is crucial knowledge in improving photodynamic therapy, which is used to treat a number of conditions including several cancers and psoriasis. The therapy uses light to activate a drug in a specific area of the body.

Scientists at STFC’s Central Laser Facility have now been able to work with colleagues from Dublin, Reading and the Diamond Light Source to examine how the drug compounds work at a fundamental level.

They’ve used a DNA crystal to get around the difficulties of observing such fast processes in living cells.

CLF’s Dr Mike Towrie said: “Metal complexes that bind to DNA are now used in chemotherapies for cancer, or have potential activity against drug resistant bacteria. We’ve been able to use our highly sensitive Ultra facility to examine interactions at a molecular level.”

By using infrared radiation, the research team could get a snapshot of the extremely fast process that takes place when light is shone on the crystals. This activates the compound, making it cause damage to DNA.
Oxsensis: optical tech firm senses aerospace opportunities

Oxfordshire SME gets the chance to demonstrate new-generation sensor technology on Airbus landing gear.

Optical sensing technology has the potential to bring really big innovations in aerospace closer to reality – such as the next generation of composite wings and all-electric aircraft.

Electrical sensors have been standard on aircraft for decades but are prone to electrical interference, so they need to be shielded from other wiring – and this adds weight.

Optical sensor solution
Optical sensors and their fibre-optic cabling solve the problem as they are immune to these effects and can also handle multiple measurements more efficiently. “They’re not even affected by a lightning strike,” said Tim Hall, senior project engineer at Oxsensis, a £1.3 million turnover company employing 22 people on the Harwell Science and Innovation Campus in Oxfordshire.

But when it comes to hostile environments, there is none much harsher than on aircraft landing gear. Temperatures vary from -55°C to 85°C, dirt and debris are thrown up by tyres and the shock and vibration of a landing is actually much greater than anything felt by the passengers.

Competitor becomes a partner
“It’s a tough place for a sensor,” said Tim. So that is where his company’s optical sensor technology will be tested, in a project involving Airbus and another sensor SME, Smart Fibres, of Bracknell. We’re quite a small company and it was a big privilege for us to work with a giant like Airbus. Landing gear is a new area for us. To get their input on our technology development was really good.

The other outcome was more surprising: a competitor becoming a collaborative partner.

Tim explained: “We’re both optical sensing companies but working together, as we did, we could actually see that our technology was complementary. Rather than displace each other, we could each produce something that was more likely to get on an aircraft.”

Both companies were invited to join a follow-on project with tier 1 aerospace suppliers. Tim acknowledged that it would not have been possible without Innovate UK.

They made us and Smart Fibres work collaboratively. Normally, Airbus wouldn’t speak to us. And without the funding, we wouldn’t have been able to build a demonstrator.

Tim Hall, senior project engineer at Oxsensis: “It was a big privilege for us to work with a giant like Airbus.”
Brand new tool for developing improved antibiotics produced by ISIS and Newcastle

Scientists have a brand new tool for developing new antibiotics and other drugs in the fight against infections such as E.coli (Escherichia coli). 2013 figures taken from the NHS website show one in five infections involving E.coli is now resistant to a commonly-used antibiotic (ciprofloxacin). Now researchers from Newcastle University and STFC have produced a working model of the outer membrane of E.coli, giving access to unprecedented information about the bacteria which is notoriously hard to study due to its size and exterior.


It is well known that all types of disease-causing bacteria are becoming resistant to antibiotics. Antimicrobial resistance has been named as the key challenge in the Longitude Prize, an initiative launched by the Prime Minister at G8 2014 with a £10 million prize fund to help solve one of the greatest issues of our time.

Single-celled Gram-negatives, the group of bacteria that E.coli belongs to, are of special concern because they have an extra wall around their cells which can protect them physically from our treatments.

“Our model of the bacterial outer membrane can be used as a simulator to test how antibiotic molecules can be made to cross this critical barrier”, Jeremy Lakey, Professor of Structural Biochemistry at Newcastle University who led the study explains. “A stable model is so important because the detailed structure of this wall is still not clear, largely because bacteria are very small and have a protective envelope that is only 20 nanometres thick. This model gives us unprecedented access to the structure and dynamics of the membrane.”

InnovationsNewsletter
Gram-negative bacteria are highly successful organisms. In evolutionary terms, they are believed to have descended from a common ancestor of cyanobacteria, which emerged 3.6 billion years ago. E. coli bacteria live in the digestive tract of people and animals and most are harmless. However, some Gram-negatives cause illnesses such as meningitis, plague, Legionnaires disease, cholera and food poisoning. Understanding the outer membranes of Gram-negative bacteria is important for antibiotic development but their structure and dynamics are poorly understood because of their small size and inaccurate lab, or in vitro, models.

The nanoscale structure of the membrane was determined using STFC’s ISIS Neutron and Muon source. An instrument called POLREF allowed the precise molecular composition to be resolved, showing accurate details of the model such as the molecular asymmetry and the thickness of its internal water layer.

“We now are able to undertake studies on model bacterial membranes under conditions which much more closely resemble those found of live bacteria than has previous been possible,” said Luke Clifton from ISIS. “Neutron scattering allows us to resolve complex structures composed of mixtures of biomolecules. By combining this with isotopic labelling, to which neutrons are very sensitive, we were able to determine where each component of the model was.”

Clifton and co-workers went on to test the response of the model to antimicrobial proteins produced in our bodies, including lysozyme and lactoferrin. Interactions of these proteins with the outer membrane in vivo and in vitro are well known, allowing for direct comparisons with the synthetic model. Neutron reflectivity revealed that the experiments reproduced in vivo behaviour, replicating the disruption of the outer membrane previously seen in living bacteria.

Jeremy Lakey said: “Biological cells are hugely complicated and we are continually trying new ways to understand their molecular structure. Neutrons are now an essential tool in this effort because they have the unique ability to both describe structure and tell the difference between the different types of molecules found in cells. Thus, in our studies of the bacterial envelope, moving to neutrons was like switching from black and white to colour TV.”

The next challenge for the researchers is to begin incorporating membrane proteins into the bilayer.

This work was funded by the Wellcome Trust.
STFC’s Hartree Centre, IBM, NVIDIA and Mellanox Launch new facility to help UK businesses exploit high performance computing

New Centre Designed to Optimise Performance of OpenPOWER Systems for Modelling & Simulation and Big Data Analytics.

Increasing performance and productivity while minimising energy consumption are challenges faced by all businesses, but especially so when exploiting high performance computing technologies. A new collaboration between IBM, NVIDIA, Mellanox and the STFC Hartree Centre aims to deliver significant competitive advantages by tackling these challenges head-on.

The UK’s first POWER Acceleration and Design Centre (PADC) aims to improve modelling, simulation and big data analytical capabilities on IBM’s OpenPOWER systems.

“The goal is simple – to boost productivity, drive growth and create jobs,” STFC Hartree Centre acting Director Dr Peter Allan said.

The new facility marks a running start to the Government’s recently announced investment and expansion of the Hartree Centre at STFC’s Daresbury site, which is designed to boost Modelling & Simulation, Big Data Analytics and Cognitive Computing research in the UK in order to deliver economic growth on a national scale.

Dr Allan said: “The PADC will help industry and academia take advantage of IBM and NVIDIA’s technological leadership in supercomputing and the Hartree Centre’s expertise and experience in delivering solutions to real-world problems. It will also provide industry and academia with access to the Hartree Centre’s research capabilities and network of global partners. The PADC will help the Government’s ambition to provide world-leading facilities to improve the productivity of UK business.”

The Hartree Centre, working with IBM, already has a history of collaborating on research and development with industry and academic institutions, and in providing access to its supercomputing facilities.

These services are now being extended to help organisations define application design and optimisation projects and will assist in bringing together an ecosystem of computational scientists and engineers with expertise in specific domains such as chemistry, fluid dynamics, structures, and acoustics.

“This new POWER Acceleration and Design Centre demonstrates IBM’s commitment to expanding the software ecosystem around OpenPOWER. The centre extends and complements the Acceleration and Design Centres in Jülich, Germany, and Montpellier, France, to a new class of industrial and commercial organisations,” said Dave Turek, IBM’s Vice President of HPC. “To that end, establishing it at the Hartree Centre is in recognition of its successful engagement with industry and its record in commercialising technological developments.”

Staff from IBM Research, NVIDIA and Hartree Centre will provide expertise and consultation to help improve performance for the GPU-accelerated OpenPOWER systems.

To achieve the highest levels of performance it is important to exploit all components of a POWER-based system: architecture, memory, storage, interconnects and integration. Consequently, the Centre will also be supported by the expertise of other OpenPOWER partners, including Mellanox, and will host a POWER-based system with the Tesla Accelerated Computing Platform, consisting of energy-efficient, high-performance NVIDIA Tesla GPU accelerators and enabling software.

You can read more about this initiative here
External Innovations and Innovations Club

The External Innovations team manages the activities that aim to realise the impacts and benefits that flow from STFC’s investments in science and technology towards commercialisation through one to one brokering, events and a range of funding schemes.

If you wish to contact the teams for more information please see the following contacts and email addresses.

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The Innovations Club newsletter contains a selection of articles drawn from our partner organisations that we think you will find interesting. We welcome your comments innovationsclub@stfc.ac.uk