Technology Strategy Board
Driving Innovation

Results of competition: Smart - Round 6 - Proof of concept

Total available funding for this competition was £9.4m from the Technology Strategy Board.

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Ammba Digital Consulting Limited	Family Film Tree	£99,445	£59,667

Project description - provided by applicants

The Family Film Tree (FFT) concept opens up archive film footage directly to the burgeoning global online genealogy market, tapping into the increasing consumer appetite for visual media content that illustrates the social history of the last century and adding a sense of place, time, work, leisure, culture and tradition to personal family history research.

Family Film Tree will create access to rights cleared archive footage clips which document over 100 years of social history across the UK. Each clip will be prepared, edited and tagged for online searching for the genealogy market in the form of an easy to use web platform. Using an API first approach will enable the re-purposing and re-packaging of rich media archive film content, Family Film Tree will employ powerful search tools combined with detailed key word tagging of archive film enabling the user to find, watch and personalise film content easily, providing a truly innovative product.

The Family Film Tree platform offers a unique commercial proposition, for both genealogy providers wanting to secure a competitive edge in this growing market and also to end consumers, happy to spend money on enhancing their own personal family histories. This will be a step change in the way people access film archive resources to enhance online genealogy research through a cost-effective, accessible and intuitive solution.

This is a resubmission. Based on the positive and constructive feedback we received from the assessors we address key points of concern – notably the technical approach for this Proof of Concept and the routes to market for Family Film Tree.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Aviation Enterprises Limited	Cost reduction of composite Flettner rotors for thrust augmentation on ocean going bulk carriers in preparation for volume production supply chain.	£93,062	£55,837
Project description - provided by applicants			
Investigation of the use of alternative materials and methods in the construction of composite rotors for thrust augmentation of ocean going bulk carriers, with the aim of minimizing cost, improving health and safety during manufacture and designing for the use of mechanized methods of manufacture.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
BAFTA (British Acad. of Film and Television Arts)	BAFTA VIDAS: Video De-duplication and Similarity Assessment	£160,052	£96,031

Project description - provided by applicants

The VIDAS project investigates the feasibility of using visual quality metrics to assess content similarity in an automated manner. This has several applications, including: piracy detection (which could include the automation of take-down notices), de-duplication of stored files, version detection, malicious or sensitive content detection, and 'pre-flight' inspection of materials for digitization or re-mastering.

The project builds on a successful earlier Technology Strategy Board supported BAFTA-UCL project (VQ-INDEX), which innovated a new mechanism for assessing visual quality in comparison with an original source. The VIDAS project will reverse this paradigm, and (with the addition of correlators, scene-cut and video resolution detectors), determine whether discovered content was derived from or is similar to a copyright holder's original.

The objective during the proof of concept study is to: a) investigate the feasibility of applying the approach of using visual quality metrics for similarity identification, and b) confirming the technology can be used to address key market requirements across a range of digital assets and requirements. Overall, this provides significant automation to processes currently performed by human viewers.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Baugh and Weedon Limited	'Spectral Analysis Bond Inspection' (SABI)	£161,536	£96,921

Project description - provided by applicants

This proof of concept project aims to demonstrate the potential of an innovative new ultrasound probe, electronics and analytical software to detect damage to, and flaws in, complex composite materials and components.

Advanced composite materials, particularly Carbon Fibre Reinforced Plastics (CFRP), are being increasingly used for critical structures and components in both civilian and military aircraft. Their mechanical stiffness and toughness, coupled with reduced weight and immunity to corrosion, make them highly desirable when compared to traditional metal alloys. However, their weakness is their vulnerability to impact damage.

A particular problem is low-energy impact damage that does not leave any visible superficial damage but can result in potentially catastrophic, invisible, damage within the composite. In particular situations, such as control surfaces and engine cowlings, the composite structure is more complex, generally including a honeycomb structure bonded within the CFRP to provide greater stiffness. Conventional high frequency (2-10 MHz) ultrasonic Non Destructive Testing (NDT) can detect flaws (e.g. de-lamination) in CFRP/GRP material but because high frequency ultrasound is rapidly attenuated in air they cannot detect bonding failures or core damage in honeycomb and foam cored materials.

Baugh and Weedon (B&W) is proposing a novel low frequency ultrasound probe that will be able to detect bonding or other structural failures in the latest multi-layer composites used in advanced aerospace designs. Unlike current approaches the intended design will be capable of being incorporated into a sensor array, to provide large area coverage and be “swept” over an area to ensure a high probability of defect detection.

The deliverable from the Project will be a proof of concept demonstrator capable of detecting known flaws in a sample and presenting the results in the form of a simple to understand “plan” view of the structure under test.

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Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Bay Systems Limited	Bay Systems Limited: Proof of Concept of a wireless sensor to measure Tyre Cavity Temperatures	£74,912	£44,947

Project description - provided by applicants

Bay Systems Limited are developing a proof of concept of a wireless Tyre Cavity Temperature sensor which can be easily fitted, is small enough to fit inside the tyre and robust enough to work whilst the tyre rotates. Accurate internal temperature measurements will improve tyre design accuracy since direct measurements within the tyre cavity will not be reliant on modelling assumptions.

The proof of concept requires the design of sensor and electronics, packaging and measurement approaches to enable reliable operation in the very constrained space available between tyre and rim. These sensors need to be compact, wireless and able to withstand the large forces and unavoidable rough handling as tyres are fitted, removed and driven in test conditions. Creating this sensor is important to tyre and vehicle manufacturers who need to understand the complex tyre material behaviours in real world conditions. This requires accurate measurements of physical tyre parameters such as temperature inside the tyre as it rotates under realistic conditions, whether in the lab or on the road. A robust, reusable sensor that is easy to use will enable this internal measurement to be cost effectively included in the tyre development regime.

Improving the design of vehicle tyres can make a critical contribution to improving vehicle ride quality, durability, energy consumption, noise and particulate matter emissions.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Bullion Tech Limited	A new process for silver recovery from all types of X-ray film that is more effective and far more energy efficient than current processes	£165,082	£99,049

Project description - provided by applicants

Many waste management companies and their customers are not aware of the true value of certain waste streams. Medical and industrial X-ray films, printed circuit boards, industrial wastes and many other 'wastes' contain small amounts of precious metals.

While many organisations separate cardboard, glass and cans for recycling, yet higher value materials are often disposed of as hazardous waste because there is a lack of understanding as to how to identify these precious metal waste streams or there is a lack of scientific knowledge and so recycling these materials seems too complicated. A prime example of this is X-ray film, which contains silver (Ag). Several major industries have stockpiled large quantities of this film. The medical industry keeps most films for between 7 and 30 years. The defence, marine, oil/gas & aerospace industries have thousands of tonnes of x-ray film taken as part of the Non-Destructive Testing (NDT) quality control of welds and cast parts in ships, submarines, tanks, aircraft, helicopters, oil rigs, pipelines, refineries and many other applications.

Film is kept for the life of the equipment, but often lies forgotten in large storage facilities. We have invented a novel hydro-chemistry process to remove silver from traditional & dry view film at the same time. Further research will allow us to explore the novel process more closely, and we believe that the technology could be refined to treat most if not all dry film types, while recovering virtually ALL the silver (99+%), with very low energy consumption, especially compared to incineration.

The benefits of the proposed process v. existing pyrolysis process are:

- Recovery of an estimated 99% of silver
- An estimated 90% saving in energy cost
- 98% cut in the carbon footprint
- Country of origin can retain control of metal recovered
- NHS, Defence, Aerospace, Marine, Offshore industries can recover value from film
- Recovery of high grade PET film worth £250 to £500/te.

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Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Cantab Research Limited	An ultra-efficient decoder for automatic speech recognition (Cantab Research)	£166,534	£99,920

Project description - provided by applicants

Speech recognition and associated services are becoming an increasingly lucrative area of business, and are emerging as increasingly common and crucial components of modern technologies such as smart phones and tablets. Currently popular large vocabulary speech recognition decoders are inefficient in terms of both memory and CPU usage and do not easily fit with the recent success of recurrent neural network language models (RNNLMs).

This project will address these issues to create a decoder that will produce results in real time on modest hardware and with vastly reduced memory and processor requirements whilst integrating RNNLMs. This will allow efficient implementation on smartphones and make cloud based speech recognition cheaper and more environmentally friendly whilst maintaining state of the art performance. The project will bring together: * the proposer's technology from a recent Recurrent Neural Net Language Modelling project * the proposer's 25 year experience in this area (inc. authoring of two previous commercial decoders) * four years of design work on this concept.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Createc Technologies Limited	3D Gamma Mapping from N-Visage Images	£68,796	£41,277

Project description - provided by applicants

Under a previous Technology Strategy Board project, we developed a 3D capable gamma radiation imager. The imager has been developed into a product and is now being used to provide a service in the UK and Japan and is being distributed elsewhere as a product.

A common customer request is for software to enable them to carry out 3D analysis on the data; currently this is an expert task which can only be carried out by a handful of individuals.

The objective of this project is to develop automation tools and algorithms to enable users with less expertise to consistently get good results and to enable expert users to complete an analysis more rapidly.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
East England Schools CIC T/A 4myschools	Teacher App	£227,313	£100,000

Project description - provided by applicants

Even though supply teachers play a critical role in our education system and are crucial in maintaining the educational continuity of pupils by covering for teacher absences for training, illness or unfilled staff vacancies, the system for supply teacher deployment is somewhat ad hoc.

Supply teachers can be deployed from a variety of sources including direct contact with schools, private supply agencies and local authority supply services. While several supply agencies have IT systems that hold candidate details in a searchable database, those databases are by and large manually updated and schools contact agency staff to match and deploy supply teachers.

Our proposal is to develop a native App that can be operated on Apple iOS and Android smartphones and once registered, candidates can in real time update their availability and schools can search for suitable candidates in a quick and efficient manner.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
ECO-I LIMITED	ECO-I LTD – Proof of Concept of a Universal embedded intelligent BMS Controller on a Single PCB	£172,542	£100,000

Project description - provided by applicants

BMS (Building Management System) plays one of the most important safety functions, controlling, monitoring, optimising, and reporting on facilities (ventilation, lighting, power, fire, security), as well as giving owners the ability to optimise comfort and efficiency. Systems linked to a BMS represent on average 55% of a building's energy usage.

A BMS consists of software+ hardware; leading to global opportunities for products and services. Estimated at $30bn USD, the industry employs over 0.5m staff and serves 150 countries. Over 10000 UK companies operate in this market. Almost every industrial and domestic building has at least one BMS Controller - a purpose-built unit that manages data (related to temperature, humidity, pressure, current, etc) which it uses to communicate instructions to BMS devices. Products that reduce energy and carbon emissions in buildings will be in increasing demand. Europe's Energy 2020 document and the Lisbon Treaty states "Energy efficiency is a key priority" and "the price of failure is too high".

Europe's Energy Performance of Buildings Directive (EPBD) targets enhancement opportunities at building controllers. Further, the Display Energy Certificates (DEC), Carbon Reduction Credits (CRC), BREEAM and IS016001, all require the use of a BMS – supporting estimates that the UK Energy market will reach £200bn by 2020 from £43bn today. BSEN 15232 (2012) was created to measure the impact of intelligent building controls on energy efficiency in buildings - expected mandatory in future building design.

This project addresses an unmet need for an energy efficient 'Universal Controller that maximises inter-changeability amongst BMS equipment, requires no wiring, no dedicated 'expert', uses common software, and maximises interoperability via the cloud. A low-cost 'Plug and Play' approach has been identified based on Smart Phone tech that will achieve this, satisfying current & future legislation and opening up new global markets.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Encasu Waste UK Ltd	Safe encapsulation of heavy metal waste (e.g. paint & ink pigments) in Pulverised Fly Ash (PFA) for use as aggregate in concrete.	£141,842	£85,105

Project description - provided by applicants

The UK paint market is currently the fourth largest in Europe, creating enough waste each year to fill 40 Olympic sized swimming pools (40 x 2,500 m3 = 100,000 m3). Thus, when developing new paint formulations, the industry must balance the performance of the paint with its environmental impact.

Depending on the intended end-use, some paints contain a number of hazardous substances and heavy metals, requiring specialist disposal via licensed contractors. Typical removal costs range between £500 & £1,000 per tonne of waste & rising with increasing landfill disposal costs. Leachable metals present in untreated paint sludge pose significant risk, since many have been shown to be bio-accumulative and toxic within the environment.

The environmental impact and high cost associated with disposal of commercial paint sludge has led EncapsuWaste to create a novel encapsulation process that cost effectively diverts paint waste from landfill. Our process aims to lock-up the leachable metals fraction, creating a cleaner, more economical disposal process, while significantly reducing the environmental impact of the waste stream.

The problems associated with hazardous paint waste disposal are not confined to the UK and as such, EncapsuWaste is hopeful that future technological and market developments will facilitate international expansion.

The benefits of the proposed process versus existing disposal are expected to be:

- Significant reduction in toxic waste to landfill
- Reduction in toxic waste leaching and its build-up in groundwater
- Reduction in disposal/treatment cost of hazardous paint waste
- • Production of a useful filler for paint manufacture or concrete production with a commercial value.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Epigem Limited	Force sensing resistive touch sensor	£166,225	£99,735

Project description - provided by applicants

Force sensing touch (FST) sensors provide extra functionality compared to existing touch sensors based on capacitive sensing. They enable a new type of gesturing – the ability for electronic devices to recognize the location and amount of force or pressure of a touch point. This can be used in track-pads, keyboards, touch screens, game controllers and the like. They enhance the user's ability to interact with an electronic device or computer and for the manufacturer they can really differentiate their product in the marketplace.

The problem is that existing FST sensors have poor uniformity of response, give false triggering, have poor mechanical robustness and need too large a first touch activation force. Our concept is to eliminate these problems by using a novel type of flexible circuit board in the construction of the sensor. This board will enable us to make resistive FST sensors without any spacer structures or air gaps and with much lower resistance of the individual sensor drive lines in the matrix pattern. Our sensor will have the additional benefits of being free from electrical interference and will draw less power, as no current flows until the sensor is touched.

Results of competition: Smart - Round 6 - Proof of concept

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Europharma Scotland Ltd	Examination of the technical feasibility of providing on-site diagnostic PCR for aquaculture	£132,037	£79,222

Project description - provided by applicants

Current methods of veterinary diagnostics in aquaculture rely heavily upon PCR which is carried out by centralised laboratory services. This results in time delays due to the collected samples having to be shipped to a remote lab prior to analysis, resulting in lost time in respect of disease diagnosis and implementation of management intervention. The current project will examine the feasibility of building a basic prototype system to carry out specialist testing and demonstration of PCR diagnostics carried out in situ in the harsh marine aquaculture environment.

A successful project will provide a pathway to the future development of commercial systems and services to provide point of care PCR diagnostics for diseases in aquaculture, facilitating a rapid response by on site staff and veterinary service providers. The system can also be used for testing seawater readiness of salmon at hactheries. Use of such a system will thus improve animal health and welfare, as well as the sustainability of aquaculture operations.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
GasDynamics Limited	homeBRU, the development of a 3kWe microCHP unit (GDL)	£165,804	£99,482

Project description - provided by applicants

This project aims to develop a novel domestic scale, micro combined heat and power unit (mCHP) able to provide low carbon heat and electrical power to the individual household. mCHP is a cost-effective building level technology that forms a central part of the government's plan to decarbonize the economy whilst providing affordable warmth.

The present technology serves as a “like for like” replacement for the conventional condensing gas boiler within both the new build and retrofit market suitable to houses and flats. It will offer the user significant reductions in running costs and reduce the carbon footprint of the household. It works in synergy with other renewable and low carbon domestic energy forms (PV, heat pumps etc.).

As part of this project, we will develop and prove the key technological components of the mCHP unit. Central to the combined power cycle are the high efficiency turbine / compressor units and the use of novel bearing and generator technologies. Their design will be optimised to maximise payback to the user whilst offering significant carbon abatement and reduction in energy use. This requires careful balance of minimizing capital / manufacturing costs and maximizing the energy yield. The market potential for the present technology is relatively large and we predict that by 2024 sales within the UK will reach 12,000 units annually, with the associated economic, social and environmental benefits.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Gulp Products	GULP PRODUCTS - iBFL - Proof Of Concept of a digital Intelligent 'Bag For Life'	£165,864	£99,518

Project description - provided by applicants

Bag for Life (BFL), is a shopping bag reused several times. An alternative of single-use paper or plastic carrier bags, it's often made from Jute, Cotton, Juco or Hessian. If ethically produced, BFL presented opportunity for positive impact on the planet. However, of the 380billion retail plastic bags used/yr in USA, just 2.5% (9.7billion) have been replaced by a BFL– arguably because they're not fit for purpose.

The BFL simply duplicated the load carrying function of a plastic bag, and relied on social moral drivers to bring about environmental change. But BFL did not offer users additional functionality or 'wow' factors, and failed to seize the opportunity to address ergonomic and associated long term health issues that result from carrying unbalanced shopping bags (plastic or otherwise) with extended arms.

As a result the BFL has become a disposable product with a limited lifespan. Younger shoppers now often use rucksacks owing to their better ergonomics, but their design does not suit grocery shopping. BFL have several limitations. Medical Mycologists report BFL lead to food poisoning, and increased risk of food borne illness (up to 50% contain coliform, and 12% E. coli) because BFL cannot be easily washed.

Further, Ergonomists and Physiotherapists warn that their use can injure neck, back, shoulders, because they distort natural curve of spine (leading to serious injuries such as herniated discs, accelerated cervical spine degeneration, and traction injury of the brachial plexus (causing shoulder/arm numbness). Treatment costs approx 0.2% of Gross Domestic Product (GDP) in the EU. Our study shows 15% could be the result of inappropriate carrying of groceries. Functionally, consumers complain that BFL offer only 1 food compartment, forcing fragile, fresh and heavy items, in addition to hot and frozen products, to reside together. This project seeks to demonstrate Proof of Concept of a Intelligent BFL (iBFL) that addresses known limitations in BFL and rucksacks

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Helionix Designs	Ultra Low Impact Chalk Tile Construction System	£147,559	£88,535

Project description - provided by applicants

Ultra Low Impact Chalk Tile Construction System Aims:

- To develop a structural building tile using abundant natural materials with no negative human or environmental health impacts;
- To develop an ultra-low environmental impact manufacturing process and building system;
- To accelerate construction sector innovation to improve sustainability performance.

Objectives:

- To develop and test
  a) the tile product;
  b) a low-impact manufacturing process for the tile;
  c) an ultra-low impact building system using the tile as a primary structural component with cost constraints comparable to market conditions;
- To secure IP for the above;
- To assess embodied energy, carbon and water impacts of the tile, manufacturing process and build system;

This project will test low impact manufacturing options for a chalk-based tile using a building system where the tile is the primary structural component, applying sophisticated construction engineering previously tested in the multi-award winning Pines Calyx ultra low carbon building.

The project is innovative because it aims:

a) To create a break-through in construction product manufacturing with very low embodied environmental impacts, using abundant natural materials with zero waste and no harmful health impacts;
b) To develop a system suited to localised manufacturing for building affordable ultralow impact homes and buildings;
c) To benefit a range of TSB programmes i.e. priorities 1 and 5 of the Low Impact Building Innovation Platform and the Modern Built Environment KTN;
d) To establish a 'design classic' to market the products and services and quickly establish brand value;
e) To create a product, manufacturing process, build system and business which maximise sustainability benefits (economic, social and environmental) and not merely minimise negative impacts.

The project will initiate an R&D programme that aims to unlock a range of paradigm shifting ultra low impact construction models for the circular economy.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Inocardia Limited	InoCardia: Cellular Work-Loop Proof of Concept	£164,012	£98,407

Project description - provided by applicants

Adverse effect of drugs on the cardiovascular system is a major cause for compounds failing in both non-clinical and clinical studies. Indeed, some of these adverse effects may only be currently detected after the compound has been granted marketing approval and many thousands of patients treated. Thus such effects represent a significant issue for human health and very high costs for the pharmaceutical industry.

Although adverse drug effects on the cardiovascular system may be due to many effects, one area of great concern is the effect of drugs on the force of contraction of the heart. Some drugs can reduce the force of contractions and cause symptoms similar to heart failure in susceptible patients whilst others can increase it resulting in an imbalance between the amount of oxygen needed by the heart and that supplied by the blood.

Currently, testing for drug effects on the force of contraction of the heart is very much dependent on the use of animals (in-vivo tests) and / or low throughput assays using isolated tissues (in-vitro tests). Given the nature of these studies testing is often conducted very late in the drug discovery process. Furthermore, the predictive value of the available tests for human risk is limited. Thus, there is a need for more predictive assays with much greater throughput that can be used to select compounds with much less effect on the heart.

The goal of this project is to test the concept of a higher throughput functional cardiac cell contractile assay under truly physiological conditions. It will essentially advance the information on how the heart behaves functionally and enable us to test inotropic drugs in these conditions. If successful, we aim to develop a higher throughput assay to test many compounds per week enabling selection of compounds for clinical trials that have less liability to adversely affect the contractility of the heart.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Lif Nano RX Ltd	Preclinical Proof of Concept for LIF Nanotherapeutics for the Treatment of Multiple Sclerosis	£177,180	£100,000

Project description - provided by applicants

MULTIPLE SCLEROSIS

Multiple Sclerosis (MS) is a disabling neurological condition commonly affecting young adults and involving 100,000 people in the UK alone. Damage or scarring of the myelin sheath - demyelination - is the hallmark of MS that progressively or intermittently causes a wide range of symptoms as specific nerves become inflamed and lose function. There is no cure and all the current therapeutic options have questionable efficacy and undesirable side effects.

LIF

The recent discovery that a small chemical messenger, leukaemia inhibitory factor (LIF), not only possesses curative properties within damaged CNS tissue, but also guides immune cells to become protective against auto-immune attack, highlights LIF as a desirable therapeutic option for MS. Simple, safe and widely accessible, LIF is also compatible with other therapeutic approaches, uniquely providing the potential for clinical synergy. Mechanistically, LIF suppresses a type of inflammatory immune cell - the "Th17" lymphocyte. "Rogue" Th17 cells may arise within specific host tissues leading to autoimmune inflammation in parts of the CNS of MS patients. LIF opposes Th17 cells by converting them to “Treg” cells - tolerogenic lymphocytes essential in preventing autoimmunity.

THE LIF-NANO INVENTION LIF-loaded, antibody targeted biodegradable nanoparticles have been formulated as a highly innovative approach to exploit LIF as a powerful natural therapeutic applicable to both autoimmunity and CNS diseases. These LIF-nano particles are able to target specific cell types creating a safe, transient, physiological microenvironment with protective and reparative properties.

LIF-NANO THERAPEUTICS

The potential value of LIF-nano is immense. LIF-Nano Therapeutics have acquired proprietary rights to this nano-technology, an approach representing a new era in therapeutics in an area of high unmet clinical need.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Nuclera Nucleics Limited	Development of a next-generation DNA synthesis platform	£183,149	£100,000

Project description - provided by applicants

Nuclera Nucleics Ltd is a Cambridge-based biotech startup transforming the life sciences through the development of a next generation DNA synthesis platform. Nuclera was founded by four enterprising scientists determined to improve the slow and expensive process of obtaining long pieces of biologically relevant DNA.

Through our novel, biologically-inspired technology we aim to furnish the life science community with rapid access to high accuracy, long DNA products such as plasmids and synthetic genomes made in the UK. This surge in pipeline efficiency will expand research horizons and help bring life-saving drugs to the global market faster.

A Technology Strategy Board Smart Award will advance our initial research and development programme. This will accelerate Nuclera's commercialisation strategy towards swiftly meeting the growing market need for long strands of DNA. With our innovative synthesis platform and rapid development trajectory, we aim to establish Nuclera as the premium UKbased provider of long DNA strands worldwide.

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Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Oceanchest Limited	Oceanchest - Beyond the Horizon: Investigation and development of an innovative technological approach to the treatment of ballast water in response to a global environmental issue.	£109,730	£65,838

Project description - provided by applicants

Maritime traffic corresponds to over 90% of all products transported internationally (IMO 2008) and the shipping industry was responsible for 95% of UK imports in 2011 (Department for Transport).2-3 million metric tonnes of ballast water are transferred globally each year (Steichen et al, 2012).

The water inside ballast tanks may contain alien species which, once discharged and established into the new environment, may disrupt the balance of the marine ecosystem (OECD, 2011). It is estimated up to 10000 species can be transported in ballast tanks (Carlton, 1999), with 10 billion tonnes of ballast water transported at any moment across the globe. As a result, the International Maritime Organisation (IMO) has implemented the International Convention for the Control and Management of Ships' Ballast Water and Sediment. Due to the imminent introduction of this legislation, which requires all ships to manage the discharge of ballast water, UK ports and shipping companies will be required to adapt existing fleets (and perhaps ports) in order to provide adequate treatment facilities and comply with the legislation.

The United States Coast Guard (USCG) has introduced a separate policy which succeeds that of the IMO in the specificity of its requirements. Oceanchest will investigate the innovative application of a technology to treat ballast water and meet the strictest of the 2 most widely adopted legislation, with the aim of reducing the global economic, environmental and social impact of alien species invasion from ballast water. This will be achieved through a variety of experiments developed with Liverpool John Moores University

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Polar Oled Limited	Polar OLED: Production Rate Curing / Cross- Linking of solution based (printed) OLED Materials using UV	£165,069	£99,041

Project description - provided by applicants

This project proves the concept of high production rate processes for the fabrication of solution processed OLEDs (or other organic electronics) using a patented UV curing process. Polar OLED has proven the benefits of UV cross-linkable materials for organic electronics, in particular for OLED. Once cross-linked they become insoluble, allowing additional layers to be deposited on top without contamination. This allows significant performance gains to be made, while the low-temperature process supports use on most flexible substrates. The combination of enabling multiple layers and a low temperature process will be invaluable as the nascent OLED and flexible display industries develop.

While UV curing is used extensively in other industries, there is currently no adoption of it within the OLED industry. No process currently exists which could migrate these materials from the lab to the production (or even pre-production) environment. This lack of process existence proof is slowing the adoption of these materials.

This project will prove the concepts of a high volume manufacturing process using UV curing. The project will address the application of multiple layers, encapsulation and benchmarking against conventional devices. While the development focus is on curing, a multi-disciplinary effort is required to optimise process and materials/inks together to deliver high manufacturing rates.

This project proves the concepts of a production process capable of being scaled to high volume manufacturing. The program includes development work on new inks, assessment of the options for UV curing (and iterating lessons learned back into the ink formulation efforts), and working with potential equipment suppliers and partners (including CPI, the Centre for Process Innovation, which will be the host for the project – placing the project at the heart of the UK's Plastic Electronics industry.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Pragmatic Printing Limited	PACES (Printed Analogue Circuits for Embedded Sensors)	£168,286	£100,000

Project description - provided by applicants

This project addresses a growing need for integrated printed electronics (PE) to provide innovative and value-adding features on plastic and other cheap substrates (paper/card) to sectors such as medical, automotive and consumer goods. The PE market is estimated to be £1.5B today, growing to £30B by 2021 and £200B by 2027 (IDTechEx), including electronic smart packaging devices (projected to grow from £0.02B in 2012 to £1B/35B units in 2022).

Printed logic circuits, predicted to be the largest sector (38%, IDTechEx), will introduce intelligence and interactivity in form-factors that don't currently exist in the marketplace. This project seeks to develop a comparator circuit based on PragmatIC's existing printed transistor technology. Validating a comparator circuit built from printed electronic (PE) components is a key enabler for interfacing flexible analogue sensors with PE digital logic, enabling large-scale, flexible smart sensing systems to be realized. These are a necessary building block for wider applications where conventional Si approaches cannot be applied due to cost or form-factor.

The most promising of these emerging markets are the near-term, wireless sensing network (WSN) and the longer-term emerging vision, the Internet of Things (IoT). These technological developments will allow everyday objects to transmit data that can be processed through the Internet and reacted upon accordingly. Examples include smart tags that can monitor temperature or humidity on food or pharmaceuticals packaging. PE devices have to date been applied to digital applications, but there is now a requirement for thin-film analogue circuitry to interface digital electronics with sensors. Analogue circuits have relatively narrow device tolerance and PragmatIC will employ robust circuit design to overcome this technical challenge for printed logic. A functional demonstrator will be produced to validate the circuit, and will be investigated for temperature and lifetime stability.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Protium MS Limited	Development of a clumped isotope laser ratiometer sample preparation and inlet system	£98,750	£59,250

Project description - provided by applicants

Clumped isotope analysis is a new analytical technique to characterise temperature histories of oil and gas bearing carbonate rock formations. This information is crucial for oil exploration to determine where and at what depth oil reservoirs are most likely to be discovered. Other techniques are used to obtain temperature histories but depend upon the presence of fluid inclusions. However, inclusions are not always present and do not provide the same precision as clumped isotope analysis. Despite the clear benefits, globally only 12 laboratories use this technique. This is because clumped isotope analysis requires the use of customised high precision mass spectrometers and inlets. These systems cost in excess of £500K and can only analyse 2 to 3 samples per day. This technique will only become accessible to the oil and gas industry if costs can be reduced and the speed of analysis increased.

Protium intends to develop a new sample preparation system that will allow isotope laser ratiometry to be used instead of high precision mass spectrometers. The lower cost of laser ratiometers could reduce overall equipment costs by up to two thirds. This system would also automate the analytical process thereby increasing sample throughout. The proposed system would process samples at a rate of 30 a day compared to 3 using existing techniques. If the project is successful, it will lead to the development of the first automated system for laser ratiometer clumped isotope analysis. Protium will achieve this by:

1. Developing an efficient rock acid digestion system and water removal traps.
2. Developing novel chemical traps to remove organic contaminants.
3. Modifying existing bulk isotope laser ratiometery inlet and electronic flow control technology developed by Protium during a recently completed Technology Strategy Board funded development project (Ref. 100984).

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Rated Interactive Media Limited	Hotel Innovation through Targeting (HIT)	£166,371	£99,822

Project description - provided by applicants

UK hotels and accommodation providers are under pressure from changing demand trends (unpredictable weather changes, last-minute reservations, highly-contextualised mobile bookings) and unlevel access to key market insights (Amadeus, 2013). A small number of global hotel chains rely heavily in analytics to shape their customer offering, whilst the majority of providers lack access to high-value data. Despite contributing 9.4% to the UK digital AdSpend (IAB, 2013) the travel industry retains the smallest average conversion rates (1.5%) (WPP, 2013).

Rated has identified an opportunity to dynamically link contextual information (incl. weather/events) to hotel room prices, improving Return on Investment (RoI) from digital Adspend in the UK travel industry. By reallocating advertising to relevant consumer segments and adapting prices to fluctuating demands, Rated can help small-medium hotel chains (£1m to £50m turnover), serviced apartment operators, and Online Travel Agents (OTAs) to improve their conversion rates and compete against global players with higher marketing budgets.

This project's key aim is to prove the concept of Rated's unique algorithm, incorporating weather and event data; and a platform-agnostic cloud-based application that encapsulates market insights from conversion rates. This project will create opportunities for small and medium hotels and serviced apartment providers to deliver targeted, high-yield marketing campaigns and dynamically adjusts pricing in response to demand/supply mismatches.

With project support from Google and Imperial College London, Rated has assembled a 7- member team with 42yrs combined experience in online travel management, digital advertising, software development and analytics, capable of meeting the complex demands of this multifaceted project.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Sipsynergy Limited	CloudTalk - Sipsynergy Limited	£164,792	£98,875

Project description - provided by applicants

A) Emerging cloud model for telecoms offers UK SMEs an opportunity to become cloud based fixed-line telephone service providers. However, existing telecoms software, required to monitor calls, generate bills and provision services are enterprise solutions, are prohibitively expensive (£5m) and require configuration by skilled engineers. UK SME service providers therefore cannot exploit opportunity presented by the cloud, resulting in an effective duopoly of Vodafone and BT in the UK fixed-line SME market, increasing costs to UK SMEs.

B) SME telecoms suppliers (rural broadband etc) are not profitable because it is difficult/uneconomical for service providers such as BT to provision services from SME suppliers.

C) Deploying telecoms hardware is expensive as it requires an engineer to deliver, install and configure hardware. Cisco CUCM is the most common telecoms management suite. Currently, providers require one £5m license of CUCM for each customer. Sipsynergy have developed MTVM (Multitenanted Voice Manager) which allows CUCM to be multi-tenanted, significantly reducing cost.

This project will prototype CloudTalk, a scalable cloud-based call management system which will add key features (VC, IM, Collaboration) and CRM suite to MTVM to create a ‘Service Provider-in-a-Box’ solution for SMEs, allowing them to cost effectively supply advanced telecoms services and manage their network. CloudTalk will:

- Feature a unique portal that allows self-provisioning of communications services, service information and fault registration.
- Allow automatic configuration of telecoms hardware from any supplier.
- Enable SME providers to offer customers an enterprise grade telecoms system (private VC, IM, presence & remote access) at affordable price.

Sipsynergy (SS) will develop a standards based Common Services API, allowing SS and other providers to interface automatically with telecoms provisioning systems, increasing the provisioning of small service providers services.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
SuperProp Limited	Development of novel folding propeller for sailing yachts	£63,250	£37,950

Project description - provided by applicants

According to Sailing Today Magazine (Sep 2011), fixed blades propellers are known to reduce speed “under sail” by a considerable 0.5-1.0knots. Therefore, many sail boat owners use folding propellers, as they minimise the unwanted drag induced on a sailing boat. Despite the predominance of folding propellers in the market, there are a number of issues associated with the folding propeller that prevent it from fully satisfying the needs of the sailing consumer.

Firstly, folding propellers have a reputation for losing working parts before the end of their design life, leaving the boat owner needing a replacement device. The weight of existing propellers is known to affect the life of the cutless rubber bearings contained in the shaft support coupling. Finally, since reverse thrust is less than adequate, manoeuvring within or close to a marina or a berth becomes significantly more treacherous. Folding propellers can be up to 3 times more expensive than standard fixed blade.

Super Prop Ltd. is a start-up company, set up to exploit specialist processing technology capable of producing a novel propeller that can address the aforementioned customer issues. Their concept solution is enabled through a specialist investment casting method developed over 30 years by Micro Metalsmiths Ltd.

The SuperProp propeller will weigh 30% less than its competitors, cost 50% less, have an average extended life of approximately 25%, and will produce more thrust by having a complex blade shape that is extremely difficult to produce by normal CNC machining methods.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
The Technology Research Centre Limited	A novel vision system with unique algorithms to recognise, count & size apples on trees to greatly improve crop forecasting and management to maximise yield and optimise market price – Applecount	£158,730	£95,238

Project description - provided by applicants

The UK is not self sufficient in apples, even during the high season, providing only one third of our own consumption, with the shortfall made up by imports. A large proportion of this is due to our inability to meet demand for class1 fruit – the stringent specification set by supermarkets, representing 80% of sales.

Our client records show that similar orchards can have outputs that vary by over 60% on the same cultivars, both on the overall tonnage yield per hectare, and on the percentage of substandard fruit, with reject fruit going to waste or low value processing and losing up to 80% of its value. A significant proportion of this variation is down to management practice and crop forecasting.

The market price is dependent on crop quality and the crop yield declared by the growers and wholesalers, and these estimates tend to be inaccurate with a variation of typically +/- 20% from final yield. This has a major impact on market price. Quotas are agreed with the supermarkets early in the season, and must be fulfilled. Over-estimating yield means purchasing imports (at late in season high prices) to cover the shortfall, while underestimating yield, means losing profits by selling excess crop to low value outlets or even for pigfeed.

A key part of management practice is to know when and how to ‘thin’ crops to promote selective growth, and this is very dependent on knowing accurately how many apples there are on each tree at various times in the growing season.

Our client who represents one third of UK growers, believes that by standardising bestpractice orchard management, and with a strategic approach to helping breed new cultivars, we could enable UK orchards to take back at least 100,000T of lost import volume, worth £50M.

This project aims to create & prove the effectiveness of a novel vision based crop measurement technology for apple growers, capable of measuring apples while on the trees.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Typhoon Products Ltd	Moulded fire protection products for hydrocarbon fires	£162,015	£96,500

Project description - provided by applicants

The company intends to develop a novel high performance moulded oil & gas fire protection system which will allow the easy and rapid over-cladding and upgrading of existing and old installations on oil rigs and other on shore installations in need of repair and maintenance, and will address a global market.

This proposed solution will result in the safe and effective reduction in the effects and seriousness of fires in chemical and off shore structures, and allow easy and regular cost effective repair of old and corroded structures, which by their very nature suffer large levels of exposure to the elements. In addition to the environmental benefits of being safer and less hazardous and less costly than existing solutions, the new products will generate extra jobs within the supply chain across the manufacturing regions of the UK and hence benefit local societies in the North of England.

The development requires an increase in the size and scale of a technology recently developed and successfully used by the company for the fire protection of bolted connections in steelframe construction. This existing composite technology has been developed by Typhoon Products Limited over the last ten years; the key element is a proprietary additive which can be added to certain polymers to create materials capable of surviving over 12 hours at 1100 degrees C and still maintain mechanical integrity in the charred state.

The technical innovation in this Proof of Concept project is in extending an existing materials technology and processing method to produce new products with considerably enhanced performance in fire.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Ultrasonic Cleaning Solutions Limited (t/a Hilsonic)	Using Ultrasound to improve breakdown of sewage solids, increase destruction of harmful micro-organisms, increase biogas generation, speed-up settlement and improve de-watering of residual biowaste – Ultrasewage -	£125,200	£75,120

Project description - provided by applicants

The 9600 sewage treatment facilities in the UK process 1.7 million te p.a. (Water UK). The main process involves the separation of solids as sludge, from the water component that then undergoes filtration and bacterial treatments to produce clean water. The sludge component undergoes processes to render it useful, most commonly including a digestion step, either aerobic or anaerobic.

Digestion can be used to produce biogas very effectively in purpose built modern reactors, a vital & growing contribution to the nation's renewable energy goals. The final bio-waste sludge can be used as a fertiliser. Sludge ideally enters the digester in a finely divided state, with the organic cell contents available for the bacteria to attack. Recent advances in power ultrasonic processing have shown the potential to increase the control and efficiency of these processes. However, a major downside of in-line ultrasonic processing, where the sonotrode is inside the pipe with small clearances for good sonic power transfer, is the propensity for blockage. Increasing the clearance requires higher power sonotrodes that undergo cavitational degradation of the tips, again requiring more frequent shutdown for replacement and maintenance.

There is an opportunity to apply our free flowing (no internal components, will not block) ultrasonic pipe technique from a food industry processing aid, to use it at medium power to provide de-agglomeration of solids & at low power to accelerate the flocculation of particles for sedimentation.

We further wish to prove the concept in the high power pre-processing of sludge, to break down cells and increase the speed and yield of digestion processes. This new technology would be retrofittable to existing lines with minimal disruption. Users could benefit from 50% higher flow rates, 30% pump power reduction, much greater process capability, much lower maintenance cost & no blockages, in addition to up to 30% improvement in biogas yield from digestion.

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Wet Engineering Limited	New Alkaline Soft Drinks Technology Development	£165,719	£99,431

Project description - provided by applicants

Soft drinks includes a range of beverages such as carbonated and diluted fruit juices, ready to drink teas, smoothies, and energy drinks. The UK sector is worth £15.0bn with volumes exceeding 14.2bn litres or 227 litres/capita for 2012.

They are formulated with water, flavouring agents and sugars/sweeteners (raw sugar, granulated sugar, fructose and high fructose corn syrup). The mains water used in manufacturing soft drinks is filtered using an industry high-pressure process known as “reverse osmosis” (RO) to remove minerals and other constituents in the water to comply with mandatory Food and Drug Administration standards. This RO water is chemically aggressive, and has a pH of 6.1 (mildly acidic) and a Total Dissolved Solids (TDS) content of 0.3mg/l. Once formulated soft drinks have of pH 2-5 (strong acid). The sugars are added to counteract the salty and bitter tastes produced by the added flavours in the acidic RO water, so their primary function is to enhance taste.

We have identified a gap in the market to develop an innovative “alkaline” soft drink technology based on alkaline water with natural flavours, free from added sugars. To achieve this, we need to develop alkaline water with “reserve alkalinity” and low TDS (<0.5mg/l) using alkaline earth elements.

Technology Strategy Board
Driving Innovation

Results of competition: Smart - Round 6 - Proof of concept

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
ZAPTOBUY Limited	ZapToBuy - mobile technology to revolutionise product placement market, the financing of films and TV and the way people shop	£112,382	£67,429

Project description - provided by applicants

With the support of the Technology Strategy Board we will develop technology and software to enable consumers of visual media to use their smartphones to easily access information about products on-screen, and purchase them. Product placement, also called brand integration, is an advertising technique used by companies to subtly promote their products through appearances in film, television or other media.

It is estimated that the global product placement market surpassed £5.5 billion in 2012 (Source: PQ Media). Despite the size of this market; advertisers, producers and consumers of visual media face numerous major constraints in promoting, viewing and purchasing products. Only major multi-national companies have products with sufficient brand recognition to warrant placing their products in visual media. Even in these circumstances, it is difficult for consumers to find the exact product they see displayed, and millions of opportunities for lucrative purchases are lost.

ZapToBuy's software and app will allow consumers to easily call up product information and purchase items they see on screen. This technology will revolutionise the product placement market delivering a range of benefits for consumers, advertisers and visual media producers. We will facilitate a dramatic reduction in irritating and often ineffective, direct advertising, as products will be integrated into programmes and films. We will facilitate a considerable flow of funds to producers and greatly simplify the funding of film and TV projects.