



# RCUK Business Plan Competition 2010

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**I am delighted to be introducing this compendium of the teams who have taken part in the 2009/10 Research Councils UK (RCUK) Business Plan Competition. The RCUK Business Plan Competition has now been running for six years and as usual the quality of this years entries has been extremely high, demonstrating the value that research can bring to business, industry and the wider economic growth and wellbeing of the UK.**

It is vital to the future prosperity of the UK that research and business work together in partnership. Research Councils UK (RCUK) actively works to encourage and enable the movement of researchers between the research base, business and industry, at every career stage and level, and in every direction. The RCUK Business Plan Competition is just one of the current mechanisms that the Research Councils have to help researchers work with business and industry to gain the relevant skills to turn their work into successful commercial ventures.

Recent research has clearly confirmed what the Research Councils have long known that public investment in research has a direct impact on GDP and this is crucial to driving UK growth in these economically fragile times. As the number of academics and higher education institutions engaging with business and industry rises further investment is attracted to the UK. From a recent RCUK report *Research for our Future: UK business success through public investment in research*, the evidence is overwhelming that it is the quality of UK research that attracts business and industry to conduct R&D in partnership with UK-based researchers. The knowledge and ideas generated by this research are key drivers of business productivity and economic growth. The international reputation of the UK research base means that we remain at the forefront of global discovery and

ensures that we have a productive economy, healthy society and contribute to a sustainable world.

The RCUK Business Plan Competition is helping academics to make those essential links with business and industry. However, in order to do this effectively, turning their academic idea into a commercially viable proposition, takes skills which have to be learnt. During this year's competition the mentoring and coaching, equipping researchers with these vital entrepreneurial skills, has been provided by Oxford Innovations. This mentoring and support is essential to ensure that the relationships built between researchers and businesses are sustained in the long-term.

Thank you to all the teams who took part in the Competition this year. As with previous participants, I am sure they will have found the process hugely valuable. The five finalists in this year's Competition come from a variety of academic backgrounds and they should each be congratulated for their commitment over the last year, during the demanding process of turning their research into award winning business propositions.

*Professor Dave Delpy, RCUK Impact Champion*

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Research is crucial for bringing innovative thought and positive economic growth to business and industry across the UK and beyond. The research supported by Research Councils UK (RCUK) has an impact on a number of sectors from creative industries and pharmaceuticals to engineering, construction and renewable energy. The RCUK Business Plan Competition is helping researchers develop the expertise to work with business and industry to turn ideas and passion into successful business propositions.

For the last six years the RCUK Business Plan Competition has provided mentoring and commercial advice to academics who believe that their research could be a viable business venture. This year's process began in the autumn of 2009 with the initial submission of ideas. Eighty three teams took part in a two day workshop to help equip them with the skills they would need to draft an outline business plan. These plans were reviewed by a panel of judges who decided which teams would progress to the next stage of the Competition.

Through mentoring and coaching provided by Oxford Innovations the teams developed a full business plan. On review of these plans the teams were further whittled down to a shortlist of just five teams from which a winner is selected. A prize of £25,000 is awarded to the winning team to be invested in the start up of their business. Four runner up prizes of £10,000 are also awarded.

This publication includes details of all the teams who entered this year's Competition along with contact details for Team Leaders who can be contacted for further information.

Throughout this publication there are also examples and case studies of successful research applications and spin-out companies from across the Research Councils.

If you would like more information about the RCUK Business Plan Competition please visit the website

**[www.rcuk.ac.uk/innovation/bpc](http://www.rcuk.ac.uk/innovation/bpc)  
or email [rcbpcomp@rcuk.ac.uk](mailto:rcbpcomp@rcuk.ac.uk)**

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## Finalists

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### **Winner**

SQUEASE™

**Team Leader: Sheraz Arif, Design London**

Epistemy – software for uncertainly quantification in the oil industry

**Team Leader: Dr Dan Arnold, Heriot-Watt University**

Avoco Medical Ltd – The Kingston Speech Valve (KSV™)  
a new generation of tracheo-oesophageal fistula speech valve

**Team Leader: Michael Fagan, University of Hull**

Teratech Components Ltd

**Team Leader: Byron Alderman, Science and  
Technology Facilities Council (STFC) Rutherford Appleton Laboratory**

Aurum Biosciences Ltd

**Team Leader: Graeme Deuchar**

## Winner

# SQUEASE™

## Team Leader: Sheraz Arif, Design London



SQUEASE™ is an item of smart clothing that helps people with Autistic Spectrum Disorders (ASD) deal with their anxiety. It does this in two ways, it allows the wearer to apply a hug-like pressure to their upper body which creates a calming effect and it has integrated headphones, which reduce the sound levels of noises that cause discomfort to people with ASD. The generous hood and sleeves, noise control and pressure application features of SQUEASE™ allows the wearer to feel protected and more at ease when on-the-move.

### Design Rationale

SQUEASE™ is the result of a user-centred design project with teenagers with ASD. In-depth research and time spent with families, children and adults with ASD revealed that this group is sensitive to anxiety and certain high frequency noises, like school bells or the sound of chairs scraping on a floor. Scientific reports<sup>1</sup> explain how children with ASD are greatly calmed by pressure, but often dislike human contact. Weighted blankets and pressure vests are usually used for applying deep pressure to smaller children. Such products are immobile and stigmatizing for teenagers. SQUEASE™ overcomes the problems of traditional deep pressure products, as it is tailored to the needs of teenagers with ASD, providing them with discreet relief whilst on the move.

### Market Need and Size

The economic impact of ASD is significant. In 2007, the Mental Health Foundation commissioned a study to estimate the cost to the UK's economy of ASD<sup>2</sup>. For people with high functioning ASD, the additional lifetime cost is estimated to be £784,785. These individuals are conscientious and able, but their sensitivity to anxiety makes every day activities very difficult. They can struggle in school, often need a lot of health and social care and this has an impact on the lives of their families. There is a need for products that can calm and provide a sense of protection for individuals with ASD.

In the core markets of the Benelux, UK and Ireland there are currently one million individuals diagnosed with ASD. A high

percentage of press and sales enquiries come from the US, which represents the most mature data set with estimates of over 1.5 million individuals with ASD<sup>3</sup>. ASD is the fastest growing developmental disorder in the US, with a 15 per cent annual growth in diagnosis. More children will be diagnosed with autism this year than with AIDS, diabetes, and cancer combined.<sup>4</sup>

### Current Status

Initial feedback and user testing of the design with both teenagers and adults has been extremely positive, with requests from both families and ASD organisations to continue the development of SQUEASE™ and bring it to market. In the first phase user research has been completed and working models of SQUEASE™ have been developed and tested. Feedback from individuals with ASD and their families has been positive and the product has attracted commercial interest from Design London, Imperial College who have invested £75,000. SQUEASE™ has been awarded Innovation Vouchers from the Dutch Government, been a Finalist in the James Dyson Awards and the Deutsche Bank Awards and was a Winner of the Matthew Wrightson Award.

\*Patent Pending



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<sup>1</sup> Ayres JA: *Sensory Integration and the Child*. Los Angeles, western Psychological Services, 1979. Barnard K, Brazelton T: *Touch: The Foundation of Experience*. Madison, International Universities Press, 1990

<sup>2</sup> [www.learningdisabilities.org.uk](http://www.learningdisabilities.org.uk)

<sup>3</sup> *Prevalence of Autism Spectrum Disorders Autism and Developmental Disabilities Monitoring Network, United States, 2006*

<sup>4</sup> Cavagnaro, Andre T., *Autistic Spectrum Disorders: Changes in the California Caseload, An Update June, 1987 June 2007*, California Health and Human Services Agency. State of California 2003 survey of developmental disabilities

## Finalist

# Epistemy – software for uncertainly quantification in the oil industry

**Team Leader: Dr Dan Arnold, Heriot-Watt University**



Epistemy (meaning 'state of knowledge') is a spin-out company from the world-renowned Institute of Petroleum Engineering at Heriot Watt University. Epistemy's purpose is to provide world-leading software and services for uncertainty quantification in the oil industry.

Correct estimation of uncertainty in future production from the oil fields allows companies to avoid the large costs of incorrect decisions such as drilling additional wells in the wrong location (a simple well offshore is estimated at \$10-20 million) and generate extra revenue by identifying undiscovered good development options (one per cent of additional reserves will provide the UK with an extra £290 million a year). Such expensive decisions are made by reservoir engineers based on the predictions of computer models. Many models can only fit the limited data available from a field, therefore there is a need for a range of forecasts that represent the true uncertainty.

Epistemy's technology automates the process of finding many models that fit the data, thereby saving an engineer time, and converts this range into probabilities. The technology then uses this data to estimate the financial risk of different development options and optimise the development strategy.

The target market is the automated history matching software market for the exploration and production (E&P) divisions of oil and gas companies. The aim is to offer the software as an annual renewable licence at a competitive cost compared to current products available on the market. In addition the company plan

to offer consultancy and training services which would leverage internal expertise in uncertainty quantification to oil and gas companies. The company will initially concentrate on sales to large to mid-sized oil companies with whom they have very good links through previous research contracts.

There are other potential markets the technology could target which the company will move into once they have successfully exploited the oil and gas market opportunities. These include carbon capture and storage, nuclear waste disposal, groundwater modelling, flood risk, logistics and applications in emerging the wave and tidal energy industry.

Epistemy was incorporated in 2009 and has already secured a SMART: Scotland award as well as over £220,000 worth of contracts and consultancy. The company has three founders with many years of experience in oil and gas, geology and software development. The company is based in Alba Innovation Centre and currently has four full time employees. The overall aim is to create a company valued at between £25 and £50 million within five to ten years.

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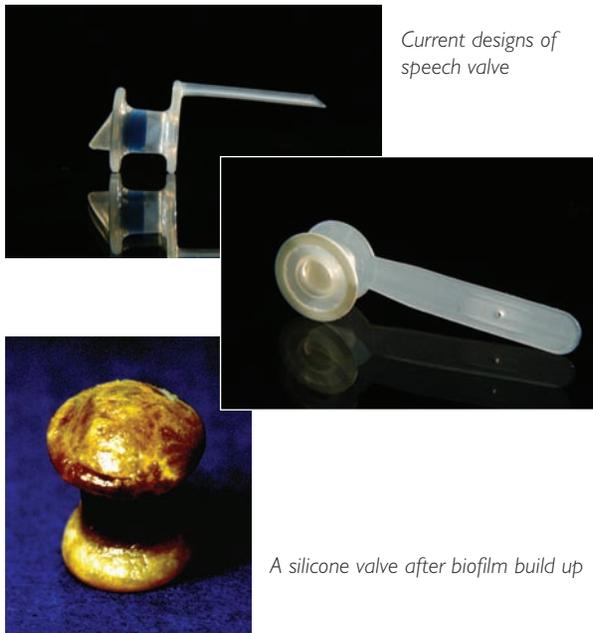
## Finalist

# Avoco Medical Ltd – The Kingston Speech Valve (KSV™) a new generation of tracheo-oesophageal fistula speech valve

**Team Leader: Michael Fagan, University of Hull**

### What is a speech valve?

Over 2,500 patients are diagnosed with cancer of the throat every year in the UK, with up to 15 per cent requiring a laryngectomy (removal of the larynx) resulting in the loss of speech. Speech restoration after the operation is one of the great challenges in head and neck cancer surgery. Currently, the most common approach is to use a speech valve which reconnects the trachea (wind pipe) and oesophagus (food pipe), and allows some vocal function to be restored. There are currently an estimated 45,000 speech valve users in the world (excluding China and India).



### Why do current designs of speech valve fail?

Current valves are manufactured from a silicone rubber, and although the initial performance of these valves is very good, they deteriorate rapidly due to biofilm growth and fail within a very short time, on average after just three months. As a result, there are estimated to be 16,500 valve changes every year in

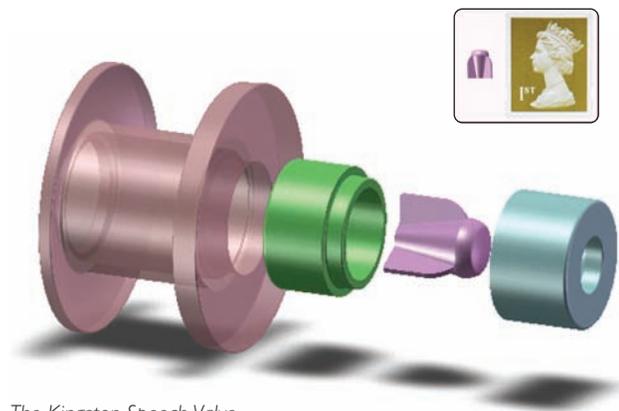
the UK alone at a cost to the NHS of nearly £10 million. With a service life of two years, the use of the KSV™ will help the NHS save around £7.5 million per year.

### What is special about the Kingston Speech Valve?

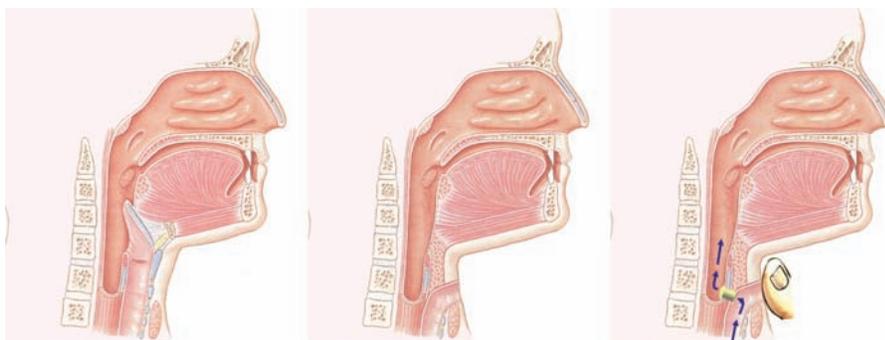
The key components of the KSV™ are manufactured from zirconia, an advanced engineering ceramic which is very hard with a high surface finish that is resistant to biofilm growth. Laboratory tests indicate that this unique design of valve will have a significantly longer life than the designs currently available. A conservative estimate is two years, but data gathered so far indicate that it could last much longer. The speech valve design is protected by a worldwide patent. It will be supplied with a specially designed multi-function insertion tool.

### Avoco Medical Ltd

Avoco Medical Ltd is a spin-out company from the Medical and Biological Engineering Research Group at the University of Hull, established to commercialise the Kingston Speech Valve. The valve has been designed within an ISO 13485 QMS quality framework, so that after successful completion of the pilot clinical trials in Spring 2011, the valve will be CE Marked allowing sales in Europe to begin. FDA approval will be sought shortly afterwards to allow access to the US market.



The Kingston Speech Valve  
(inset show the relative size of the components)



Normal anatomy

Anatomy after  
Laryngectomy

Insertion and use of  
a speech valve

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## Finalist

# Teratech Components Ltd



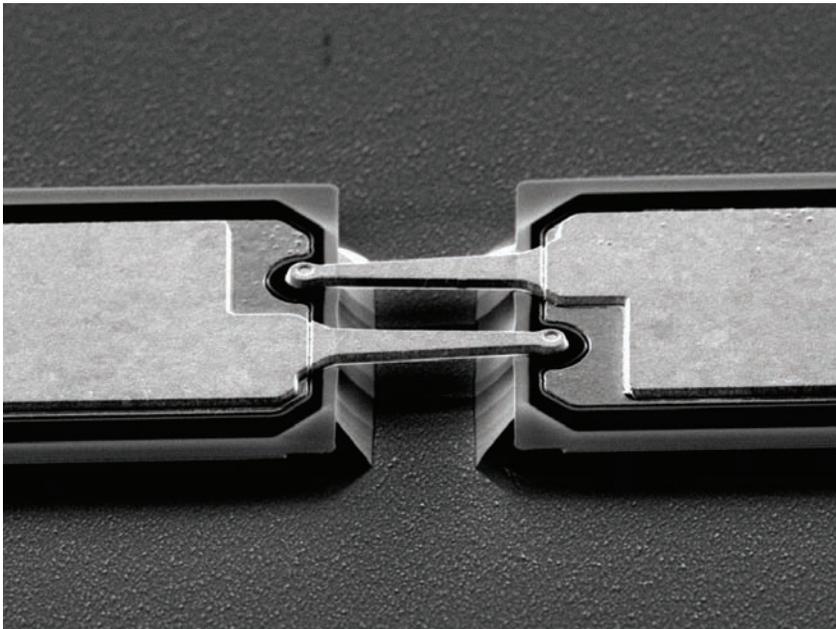
## Team Leader: Byron Alderman, Science and Technology Facilities Council (STFC) Rutherford Appleton Laboratory

Teratech is a new company being spun out from STFC Rutherford Appleton Laboratory in order to exploit recent developments in terahertz electronics. This frequency range was originally developed for niche applications in astronomy and remote sensing of the Earth's atmosphere, but as the technology has matured, and the costs reduced, new commercial applications are becoming viable.

The terahertz region between microwaves and infrared is still a largely unexplored part of the electromagnetic spectrum, with wide-ranging and cross-disciplinary applications spanning the physical, biological, and medical sciences. For example, there has been a growing interest over the past five years in the application of terahertz frequencies to security imaging, with popular news articles showing images of people walking through scanners which apparently "see" through clothing. The pharmaceutical and manufacturing industries are also becoming aware of the unique properties of terahertz radiation for

spectroscopic analysis and inspection through multi layered, optically opaque, surfaces.

The technology being exploited by Teratech depends on the fabrication of electronic devices that operate above 100 GHz, where traditional electronic circuits no longer function. It is a generic device technology that can be used as both a detector and source of terahertz radiation, opening the potential for very high frequency communication systems and radars. The devices, which are called Schottky Diodes, operate at room temperature, rather than under cryogenic conditions like most competitor technologies, significantly simplifying system infrastructure and reducing cost. This technology is currently being exploited through the commercial programme of STFC. Teratech, operating as a fully independent commercial entity, will widen this engagement with industry and seek new markets outside the traditional Space sector.



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*Typical Schottky diode (image size is approximately on the scale of the cross section of a human hair)*

## Finalist

# Aurum Biosciences Ltd

## Team Leader: Graeme Deuchar

Aurum Biosciences Ltd is a new biopharmaceutical company dedicated to the development of novel diagnostic and therapeutic agents, initially for Acute Ischaemic Stroke (AIS). Patients, with AIS (defined as patients who start receiving medical care anything up to 48 hours following stroke) will often have brain tissue that can be saved with timely intervention. However, there is currently no clinically acceptable method for detecting such tissue. Aurum will provide the means to detect this tissue, improving patient outcome and the resulting costs of a stroke on both the NHS and society as a whole. It also has the advantage of providing a therapeutic effect in stroke, thus the initial Aurum product is a true theranostic.

The company is currently seeking funding to take the stroke management product ("Aurum") to the end of preclinical development and into phase one and two clinical studies of efficacy and safety. Current diagnostic approaches do not provide wholly reliable or complete data on damage to brain tissue and there is currently only one approved product for the treatment of AIS; Actilyse (tPA). Actilyse has major safety limitations and must be used within three hours of stroke onset, but for many patients time of onset is unknown. Consequently, it is used in only five per cent of patients. With Aurum, when the patient arrives at the hospital a diagnostic scan will quickly and accurately identify the extent of brain damage. The physician can then decide on treatment with further Aurum and/or thrombolysis for each

patient, many of whom would not be candidates for life-saving therapy without this information.

Aurum is unique in having both diagnostic and therapeutic applications in stroke. The competitive AIS landscape shows few promising competitors in the pipeline. Aurum is based on a technology from one of Europe's leading stroke centres (Glasgow). It is expected to be extremely safe, exerting its effects through a natural agent (oxygen), and therefore the time window for diagnosis and treatment will be much greater. The potential usage of Aurum could eventually extend to all AIS patients and a premium price for the product can therefore be expected.

Aurum products will initially be aimed at the AIS market; however the company will develop a product pipeline with future products being developed for use in cardiac, cancer and neurodegenerative diseases.

The Management Team is composed of individuals with proven industry track records and a group of highly experienced and highly motivated scientists.

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## Previous winners

**Over the last six years the Research Councils UK (RCUK) Business Plan Competition has provided mentoring and support to numerous researchers helping them turn their ideas into reality. The prize money has proved invaluable in helping previous winners of the competition gain brand recognition and secure further investment in their company.**

In 2008 Dr Ben Panter and his team from the University of Edinburgh won the top prize and invested it in their spin-out company Blackford Analysis. Dr Panter has said the Competition was "extremely useful for my team as we transformed from an academic group into a company. It was the first time that anyone had really pressed us for the details of how we were going to take an interesting technology and actually build and sell a product from it. The training and mentoring was relevant, interesting and comprehensive - and the business plan we wrote was used to raise a six-figure seed investment. Putting the prize straight in Blackford Analysis has allowed us to maintain a strong equity position, and given us a core to structure the deal around.

Blackford Analysis is the creation of a team of researchers, led by Dr Panter, from the University of Edinburgh that builds processing solutions using MOPED, a patented technology which speeds up computation involving large datasets.

The real impact of winning the competition has also been felt by 2006 winners Warwick Warp who in only four years have seen their business grow dramatically. The company specialises in the development of innovative new technology for accurate matching of low-quality biometric samples. This technology incorporates a completely new approach to fingerprint matching that exceeds established accuracy benchmarks.

Dr Li Wang of Warwick Warp said: "Winning the RCUK Business Plan Competition has been invaluable for development of Warwick Warp. The prize enabled us to bridge the gap between research development and commercial application. As competition winners the company profile became well known and it encouraged venture capitalists to consider our business proposition which led to the first tranche of equity investment. The attention and brand awareness the competition afforded became crucial to the development of the company and was a solid start to what is now a very successful enterprise supplying solutions to customers around the world."

The global biometrics market is expected to reach \$6 billion by 2010 and Warwick Warp is poised to make a significant technological contribution to the industry with its unique, innovative products and intellectual property for licence. The company has released its first commercial product for the automated fingerprint identification market and has a development roadmap that will deliver new solutions to support the performance requirements of the rapidly growing biometrics market.

Over the years the Business Plan Competition has seen a huge variety of research turned into viable business plans from communication technology, healthcare applications, intelligence software, energy solutions, wellbeing products, nanotechnology and services.

This year's Business Plan Competition is again made up of a variety of business concepts from researchers across the UK. These innovative and groundbreaking ideas have the potential to form the basis of a new business venture that could propel the inventor into the commercial world.



*Dr Ben Panter (2nd left) and the Blackford Analysis team at the final of the RCUK Business Plan Competition 2008*

# My EcoPets

## Team Leader: Professor Miles Pennington, Royal College of Art

My EcoPets®, will be the next must have children's brand. Spearheaded by a range of environmentally focused, magical and intriguing electronic toy characters and children's gaming experience My EcoPets® will spark the imagination of pre-teen children, empowering them to make an environmental difference.

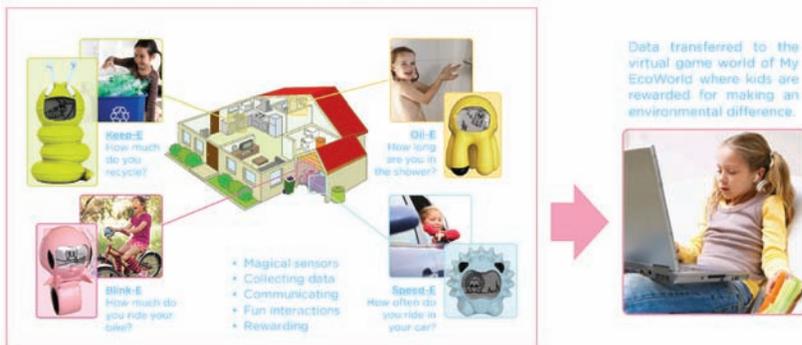
My EcoPets® are a range of quirky environmentally focused virtual characters that live within My EcoWorld™ on either a dedicated handheld gaming console or online website. The My EcoPets® virtual characters also have real world alter ego's (the MEP Agents – toys) that are positioned and live around a players home... they are everywhere!

Each MEP Agent has its own particular magical sensor: The MEP Agents spend their time collecting data (and being cheeky in the process) on certain household behaviours that are impacting on both the My EcoPets®: 'Real World', through global warming etc., but also their virtual world, found within the games console or online site. The MEP Agents regularly transmit back to the My EcoWorld™ game the latest monitored real world behaviour data where it is then interpreted. The greater a players change in behaviour in the 'real world' the greater are handheld or online gaming virtual rewards.

My EcoPets® has been developed by Professor Miles Pennington, Head of Department of Innovation Design Engineering at the Royal College of Art, and is currently looking for funding to provide the working capital to enable commercial development as well as new product development of a line of sustainable toy concepts. Professor Pennington's objective is to generate revenues through licensing My EcoPets®, and further environmentally focused concepts, to major global toys and games companies and cross licensing the My EcoPets® brand into other children's' sectors, resulting in significant royalty returns.

## MyEcoPets® Children Driving Environmental Change

A series of electronic quirky toy characters with 'magical' sensors monitoring your behaviour



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## Postgraduate Toolbox – Leading Postgraduate Recruitment



## Team Leader: Daniel Colegate, University of Durham

### The opportunity

There are currently more than half a million individuals in the UK studying for a higher degree such as a Masters or PhD qualification and almost 80 per cent of them will enter the commercial and public sectors upon graduation. The market for graduate recruitment in the UK is worth an estimated £1.5 billion annually and Postgraduate Toolbox aims to capture the emerging postgraduate recruitment market. Recent surveys amongst top graduate recruiters reveal that more than 70 per cent of companies are already giving preference to applications from individuals with postgraduate degrees. Employers recognise the key attributes of postgraduates such as enhanced analytical thinking and problem solving skills, maturity, ideas generation, specialist knowledge and research skills.

However, postgraduates are a difficult audience to reach in large numbers because university graduate schools are highly decentralised. Postgraduate Toolbox will make it easy to solicit applications from the most capable, suitable and highly qualified postgraduates throughout the UK.

### The business

The business will create an information channel that can connect businesses directly to this highly valuable demographic. Postgraduate Toolbox Ltd already owns and operates the largest online community of postgraduates in the world, which gives them a pre-start mailing list of more than 15,000 postgraduates. Using Business Link grant funding they have already completed a beta version of a new web platform called Postgraduate Toolbox which will be used to combine postgraduate news, blogs, online

resources and competitions with a directory of useful businesses and a specialised recruitment service.

It is this specialised recruitment service that will provide the primary revenue stream. Businesses will pay a registration fee for the online recruitment services and then pay for each vacancy added to the platform. Additional premium services such as CV screening and managed headhunting will be introduced. Target sectors include business and finance, IT, patent law, research and development and the public sector. In the short term, supplementary working capital has already been raised by selling advertising space on the Postgraduate Toolbox beta web platform.

### Competitors

Primary competitors are existing graduate recruitment websites such as Monster, Fish4 and Milkround who target the first degree market. Postgraduate Toolbox's competitive advantage is the unique focus on postgraduates. Employers who specifically want to access this higher talent will not be lost amongst other positions on the generic jobsites. Similarly, postgraduates who want their additional skills to be valued will know that Postgraduate Toolbox careers are suitable for them. Furthermore, the Postgraduate Toolbox platform has been

integrated with social media channels such as Facebook and Twitter.

### Financial Information

- The financial projections indicate turnover of £80,000 in year one rising to £900,000 by the end of year three. (EBITDA of £400,000).
- The company is currently seeking proof of concept investment of £80,000 for market research and technical product development in the North East region to establish a pilot service over the next 12 months.
- The business will be sold at the end of the third year. Based on turnover and profit projections sales are expected to achieve a value of £2 million.

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## Healthcare Simply

### Team Leader: Matthew Wilcox, Newcastle University

In the UK alone more than 60 per cent of the population (aged 16 years and over) believe they are overweight and want to lose weight. In 2008 they spent over £1.05 billion on slimming products and this is predicted to grow nine per cent per year. However 40 per cent of the UK population (aged 16 years and over) have tried and failed to lose weight, this is due to poor products that do not live up to their claims and also due to busy lifestyles where convenience food is rated higher than health food.

Healthcare Simply has developed Aligon™ a protected natural food ingredient that can help people lose weight. Aligon™ is made from a blend of patented seaweed extracts and it can be added to a wide range of food products at high levels without altering the products taste, texture, or smell. This has been demonstrated with the addition of Aligon™ to bread (10 per cent) and in a blinded consumers study it was preferred over its standard counterpart.

When included in a food product such as bread, Aligon™ can reduce the fat up take of the entire meal the bread is eaten with, which will help people lose weight. This will appeal to the end consumers as they can lose weight by simply replacing their ordinary products with a products containing Aligon™. This will not compromise the taste experience and enjoyment of their food products, a problem which is normally associated with diet foods. For more information on the company and the technology used in the product, please visit [www.healthcaresimply.com](http://www.healthcaresimply.com).

There are currently no food products on the market that can claim to help a person lose weight. The health claim

regulations that came into force in 2009 mean more extensive human study data is required before the European Food Safety Authority (EFSA) will approve a health claim of a food. EFSA rejected all previous health claims that were not backed up by strong enough data, to increase public belief in health claims on products.

The current methods of weight loss that have been shown to work are; changes to the diet, increasing the amount of exercise, pharmaceutical drugs, and surgery. Diet modification and exercise are obviously the treatment of choice, however both are hard to implement in a busy lifestyle and again both are hard to maintain. The pharmaceutical drugs that are available have shown to be effective, but all come with severe negative side effects, which affects patient compliance. Surgery is generally the final option for the severely obese, however this is high risk and is not always feasible in all patients, for example obese patients are likely to have high blood pressure which excludes them from a surgical procedure. Healthcare Simply offers a natural alternative to help a person lose weight. Including Aligon™, a natural seaweed extract, into existing foods it allows people to lose weight in a manner that suits them, making it an ideal solution.

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# The Virtual Engineer

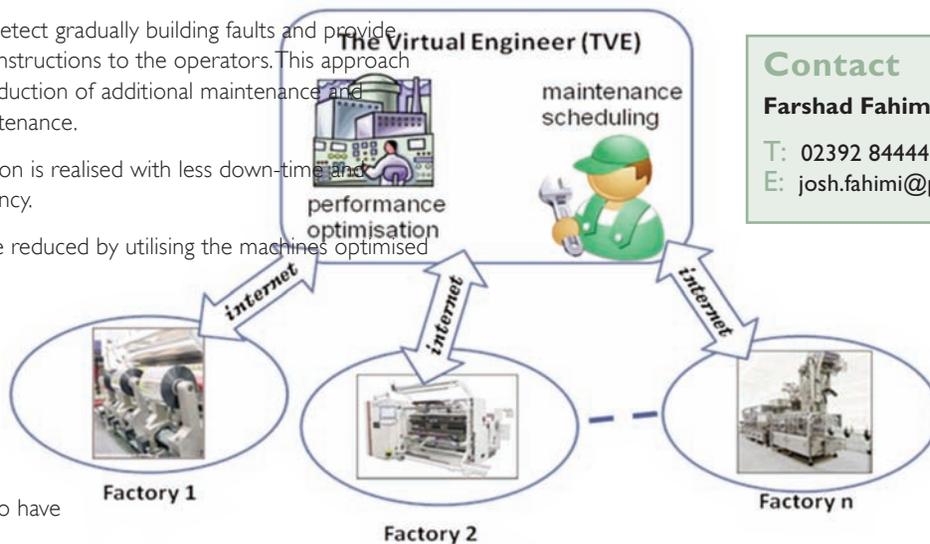
**Team Leader: Farshad Fahimi, Institute of Industrial Research, University of Portsmouth**

The product is a software-based optimisation system to be housed in a "Cloud" computing server, called "The Virtual Engineer (TVE)". The system will make savings to energy costs and increase the efficiency of electromechanical machinery infrastructures by using non-invasive sensing technology to reduce down-times. In more detail the advantages of using TVE (UK Patent Application 0921900.7) are as follows:

1. TVE uses trend analysis on a network of electrical machinery. The increasing expertise acquired by the system from the analysis is unique in predictive diagnostics.
2. TVE is able to detect gradually building faults and provide compensatory instructions to the operators. This approach results in the reduction of additional maintenance and associated maintenance.
3. Higher production is realised with less down-time and increased efficiency.
4. Energy costs are reduced by utilising the machines optimised mode.

The TVE system will be accessed remotely by the customers. Every purchaser will pay a license fee for each machine they wish to have

installed on the system. The customer's machine will be connected to the Cloud server operated and hosted by the company, which will provide real-time analysis of the performance of the machine during its operating cycle. Performance, optimisation and maintenance scheduling information will then feed back to the customer. Thus, TVE will provide expert engineering support for machine users, at a significantly lower cost than employing similarly skilled engineers.



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# Electrical Impedance Tomography (EIT) Biosensor

**Team Leader: Stephen Butler, Biomedical Sciences, Middlesex University**

Researchers at Middlesex University have developed a novel biochemistry for the capture and monitoring of biomolecules. The quantification and detection of biomolecules (analytes) is at the foundation of diagnostic medicine.

Electrochemical biosensors (including the team's own based on EIT) have indicated their advantages of simplicity, low cost and high miniaturisation making them easy to make, dispose of and transport. They are also precise and provide analytical time reduction and a completely label-free detection.

The team's sensor is based on EIT measurement coupled with immunospecificity which takes advantage of the best elements of the established ELISA test and combines it with the miniaturisation and simplicity of EIT biosensors. The team recently published an application for the detection of the pregnancy hormone hCG by this method, with great potential in the pregnancy detection and cancer monitoring markets. However, by simply changing the capture antibody, the device could be monitored to detect any analyte at

point of care or, with modification, continuously. The device could therefore be applied to:

1. Over the counter pregnancy and ovulation home tests (Pharmaceutical Industry).
2. At home continual monitoring of cancer remission/recurrence (NHS/Medical).
3. Monitoring of airborne or environmental bioagents/microorganisms (MOD and/or the Environment agency).

The patented technology held by the management team is a combination of the unique molecular capture and the detection system which monitors the changes in captured analyte. The team now wishes to explore routes to the design and commercialisation of this emerging technology.

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## The value of research

**Research has an impact on all our lives. Whether it is an invention that makes our lives better or a breakthrough in experimental science that leads to more questions about the origins of the universe, research is important.**

In the late 1990s, when Professor Shankar Balasubramanian and his colleague David Klenerman, bumped into each other in the Cambridge University tea room little did they know that years later their research partnership would develop the world's leading DNA sequencing product and that their spin-out company, Solexa, would be sold for \$600 million making it the most successful the university had ever seen.

Professor Balasubramanian says: "I am an organic chemist, while David's expertise is in physical chemistry. He had helped me out on a project that required a laser and while chatting one day we came up with some new ideas for some fundamental experiments, including building a system to watch a single molecule of an enzyme extend a piece of DNA. It was pure curiosity-driven science; we had no commercial application in mind at all. We were lucky enough to get a couple of BBSRC project grants, and these contributed to everything that followed."

With venture capital funding, Solexa was set up to commercialise the technology. Twelve years on, Solexa's latest system can sequence a couple of genomes in one week – working one millionfold faster than the 1998 version. Professor Balasubramanian remains on the company's science advisory board.



Research is incredibly valuable. The announcement confirming the science budget in the 2010 spending review make it clear just how important it is to the economic growth and long-term prosperity of the UK. Researchers start out with an idea which is nurtured and supported by the funding they receive from Research Councils UK (RCUK) and it is this support that helps turn that spark of an idea into the discoveries and inventions that have an impact on us all.

This impact has been clearly demonstrated in various reports including "Research for our Future: UK business success through public investment in research" which invited input from leading decision-makers from business and industry in the UK and elsewhere, and examines why they choose to work in partnership with British researchers.

The evidence is overwhelming in support of the view that it is the quality of UK research that attracts business and industry to conduct R&D in partnership with researchers and that the knowledge and ideas generated by this research are key drivers of business productivity and economic growth.

The report concluded that continued public investment in research is essential for the success of UK business and industry. It found that the greatest long-term productivity advances come through breakthroughs in basic knowledge and that publicly funded research raises the productivity of R&D in the private sector. The report also found that research institutions produce highly trained graduates which are an essential resource for UK companies and foreign companies investing in the UK. The input from business in the report confirmed that it is the high quality of UK research makes the country attractive for inward investment by international business and industry through collaborations. A copy of the report can be found at: [www.rcuk.ac.uk/aboutrcuk/publications/corporate/future](http://www.rcuk.ac.uk/aboutrcuk/publications/corporate/future)

As well as access to groundbreaking research, businesses have long valued the access to talented people and expertise working with UK higher education institutions the UK affords. The supply of highly-trained graduates coming out of UK universities is consistently strong and one of the greatest exports the sector has.

In 2001 Professor Andre Geim, along with his colleague Konstantin Novoselov, were awarded a small research grant to support a variety of curiosity-driven projects. They went on to discover Graphene which, at one atom thick, is the thinnest material in the universe and the strongest ever measured. Professor Geim says: "I am driven by a search for the new and unknown. I am essentially looking for the blank spots on the map. We want to be the first to discover what will be 'hot' in the next five years."

The implications of this new, supermaterial are enormous and further funding means that Professor Geim's team are now investigating Graphene's potential for industrial and social benefits around the world. Professor Geim said: "This is still a very new area, so we are still at the stage of assessing graphene applications, but already the initial investments have been returned in taxes, and in ten years' time the government will have its investment repaid a thousand times over."

In 2010 Professor Geim was awarded the Nobel Prize for Physics as a result of this work.

# KusKus

## Team Leader: Dr Yvonne Marshall, University of Southampton

KusKus is inspired by the talent, skill and ingenuity of crafts people living in the Pacific Rim region. KusKus' ethos is to recognise, develop and market high quality indigenous crafts from the Pacific Rim region in a way that respects and financially rewards the high skill and creativity of its producers. KusKus does not believe in the charity image afforded to so many schemes which bring indigenous crafts to the UK market. The KusKus ethos ensures that benefits are distributed across the KusKus community to owners, producers, employees and consumers. KusKus is also dedicated to ongoing research of oral histories and archaeological backgrounds which feedback to enrich product design and development, and increase awareness of indigenous crafts peoples rich heritage.



### Stories

KusKus takes the customer into the local Pacific worlds of the crafts people making their unique products. Buyers can explore how an artisan has developed their range of products and learn the 'stories' that belong with the product - is a scarf really just a scarf, or does it tell a story about the lives and values of a local people? When a KusKus product arrives in its special packaging the story will accompany the product, but more than this, the story is now in the western world and by valuing it here we sustain and grow respect for, and awareness of, the gifted craftspeople of these diverse Pacific communities.



Dr Sandy Budden



Dr Yvonne Marshall

### Practically local

The indigenous producers live in beautiful, but very remote places. Their lives are very different to ours in the globalised western world. We in the west value this diversity as it affords us wonderful places to imagine and visit, both actually, virtually, and through the purchase of KusKus products. Pacific people depend on skills and knowledge embedded in and specific to their worlds. KusKus sustains, develops and promotes the skills which underpin life in these remote communities, making possible more creative, independent lives while enriching engagement with the global community.

### Virtually global

Social networking technologies are the heart of KusKus. They not only drive and deliver commerce, but also engage people, drawing them into new creative virtual communities with global reach around the Pacific Rim and out to Britain. KusKus' unique web community and design development scheme uses cutting edge Web3.0 technologies to bring Pacific craftspeople into contact with each other and with aspiring young British designers. Through this virtual cross-pollination, and selected KusKus funded producer and designer exchange visits, the company will promote design development engendering new and exciting products unique to the KusKus label.

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# eScent®

## Team Leader: Dr Jenny Tillotson, Central St Martins

Sensory Design & Technology Ltd (SD&T) is seeking investment to develop and sell eScent® jewellery at a retailer in time for Christmas 2012. The company mission is to enhance the 'wellbeing' of women. Women are having children later in life; they want to stay young, feel good and look good for a longer period of time and their spending power is at its greatest between the ages of 35-45.



The target market is 'wellbeing' which has been on the increase in recent years. It is currently valued at £212 million in the UK and set to rise. There is increased media attention and consumer focus on environmentally friendly 'eco' products which are also pushing the growth of this market. This is increased by regulation to ensure product claims are valid due to fake 'wellbeing' claims.



£38 million in the UK. By 2014, sales of such products are expected to reach £45.3 million.

There are more than 8.5 million people in the UK who survive on as little as four hours of sleep a night. Women particularly find the juggling act of holding down a job and family life extremely challenging. Half of employed mothers reported sleep deprivation causing acute levels of stress and placing tremendous burden on marriages. Products to improve sleep grew by 10 per cent in 2009 and are worth

This need is met by selling eScent®; scent dispensing jewellery that is solvent-free, reduces anxiety, improves sleep, rejuvenates the mind and is kinder to the skin. The way people use scent today in almost all applications is poorly targeted, inefficient and wasteful. eScent® is for everyday use; it is a high-tech product that is programmed to deliver a 'wardrobe of fragrances' to improve 'wellbeing', help relax and unwind.

eScent® is fabricated from a built-in microfluidic device and delivers a personalised scent therapy experience, focussed solely for the user – day and night. It offers a patented, timed/controlled therapeutic scent dispenser which can also be placed on a bedside table, a child's car seat or crib. The business model lies in SD&T designing the products, distributed initially by an exclusive launch at a retailer. The secondary market is for SD&T to sell replaceable cartridges as consumable products which are expected to be considerably greater than the primary market.



At a later stage, the company will expand further into other market opportunities including medical, mobile phones, consumer products and apparel. The company would seek further investment from leading fashion designers to miniaturise eScent® and integrate within buttons to deliver their own signature perfumes.



SD&T has an experienced management team with the relevant skills for this business in Fashion, Fragrance, Microfluidics and Biotechnology. The Chairman designate of the company is the former Chairman of the Fragrance Foundation. The company was founded by Dr Jenny Tillotson, a Senior Research Fellow in Fashion at Central Saint Martins and Visiting Scholar at the University of Cambridge. Dr Tillotson is acknowledged as a pioneer in the growing science and art of Scentsory Design®; computerised scent-output systems worn on the body for fashion and 'wellbeing' applications. She gained commercial experience working for a Wearable Technology company spinout from the MIT Media Lab.

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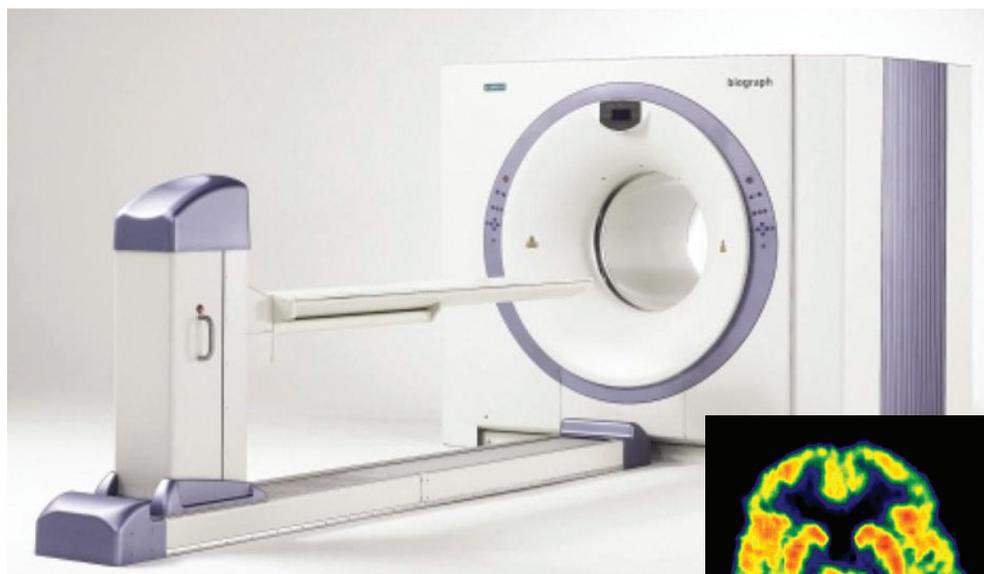
[www.sensors.cam.ac.uk/members/profile/519](http://www.sensors.cam.ac.uk/members/profile/519)

# NewImaging Ltd – Realising the potential of personalised medicine through medical imaging

**Team Leader: Dr Michael Carroll, Newcastle University**

## Platform technology for the supply of PET imaging agents

Pioneering research in the development of Positron Emission Tomography (PET) imaging agents by Dr Mike Carroll and his team at Newcastle University has led to the first generic, efficient, and highly selective approach to the formation of [ $^{18}\text{F}$ ]fluoroarenes.



PET is a non-invasive medical imaging technique which allows the distribution and kinetics of molecules of interest to be determined in vivo. These key advantages over other imaging modalities (e.g. MRI, CT, X-ray) has seen the demand for PET services increase significantly. Global growth is anticipated long-term with 7.1 million annual clinical procedures predicted by 2015 and clinical imaging agent sales alone expected to rise to \$814 million by 2011. Currently, the vast majority (more than 95 per cent) of this market only involves the use of a single imaging agent i.e. [ $^{18}\text{F}$ ]FDG, which is typically only used for drug metabolism studies in oncology. It is therefore widely acknowledged within the global healthcare community that if the full diagnostic and therapeutic potential of PET is to be realised, access to additional imaging agents is urgently needed. It is this gap in the market that NewImaging Ltd PET technology will bridge.

Significant investment is needed to prepare each new agent due to the complexity of the multiple 'step' and multiple 'pot' transformations employed. However, the PET technology uses the same 'one-step-one-pot' process, irrespective of substrate, which is both essential to process automation and critical to end-point GMP grade synthesis in the clinic.

For example, the group at Newcastle University have already developed the only highly efficient 'one-step-one-pot' process for the production of 4[ $^{18}\text{F}$ ]SFB (a key imaging agent used to label peptides and bio-macromolecules pre-clinically) the clinical potential of which is yet to be realised due to the fact that current production involves a complex 'three-step-multiple-pot'

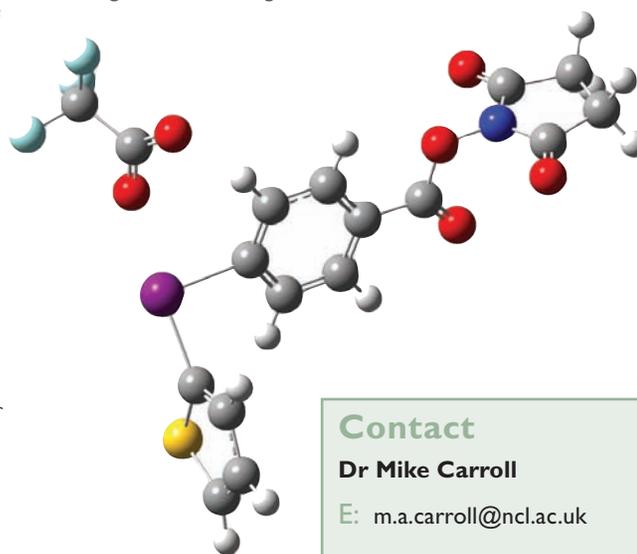
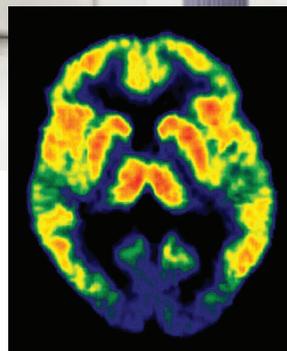
process. This agent, together with a range of additional [ $^{18}\text{F}$ ]fluoroarenes and their 'one-step-one-pot' method of manufacture, is already the subject of parallel US and UK patent applications.

In addition, the generic nature of the technology allows the practical production of imaging agents that to date have been impossible to make using conventional radiochemistry. As a

result, focused R&D is now ongoing that is anticipated to result in the creation of a high value patent family encompassing synthetic precursor production, enabling radiochemistry, platform interoperability, and (longer term) the development of proprietary imaging agents.

The group intend that spin-out company NewImaging Limited will meet the increasing global demand for PET provision through both the supply of pre-clinical and clinical imaging agent precursors, and the provision of 'gold-standard' contract PET research services. The early inclusion of PET

studies in conventional drug discovery and development programmes has already demonstrated substantial time and cost savings to existing biopharmaceutical business models, but the sector currently lacks the in-house expertise to take full advantage of the offerings.



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# A Novel Screening Test for Down's Syndrome

**Team Leader: Dr Stephen Butler, Biomedical Science, Middlesex University**

Currently all pregnant women in the UK are offered some form of early pregnancy screening test. A form of gestational screening test is currently offered to most women in all developed countries.

According to government statistics in the UK there are over 650,000 live births and in the US 4.5 million live births each year. Accounting for pregnancy losses at present there is a total combined UK/US market of eight million pregnancies per year and each pregnancy requires a test.

Researchers at Middlesex University have developed a novel test based on a structural change in the molecules produced by the very early placental cells of the foetus. The simple test looks directly at the molecules in maternal urine samples using instruments that resolve miniscule variations in molecular mass which occur as a result of metabolic changes associated with a developing foetus with Downs Syndrome. The test is greater than 99 per cent diagnostic with a 0 per cent false positive rate in tests analysed thus far. National guidelines proposed to improve screening methods to 90 per cent detection at less than 1 per cent FP by April 2010 – this target has yet to be achieved.

#### Benefits of the new test:

- Improved sensitivity and specificity reduced need for amniocentesis and accidental abortion.

- Less invasive, it only requires urine and no surgery or blood sampling is needed.
- More rapid in turnaround of results, less waiting, reduced anxiety and earlier decision making.
- Conducted earlier in pregnancy thus allowing more time for consideration of outcome.
- Potential to post samples, so reduced clinic visit and remote diagnosis.
- Cheaper cost to service provider or private patient (current costs after infrastructure/equipment outlay in NHS at £17-£28 depending on service offered. The estimated licence cost is £10, private £35)
- Semi automated and comparatively simple which eliminates operator error risk which currently affects detection rate.

#### The business to date

Patents are being filed and potential hardware partners have shown significant interest. The management team is comprised of research professors and business professionals from the pharmaceutical industry.

#### Contact

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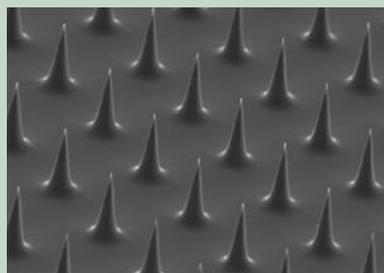
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## Chilton Bioscience

**Team Leader: Derek Jenkins, Science and Technology Facilities Council (STFC) Rutherford Appleton Laboratory**

Chilton Bioscience will be established to manufacture ultra-high density low cost microneedle arrays and novel coating technology to allow needleless drug and vaccine delivery via simple press on skin patches.



*Microneedle array developed at the Rutherford Appleton Laboratory*

novel manufacturing technology developed within the Rutherford Appleton Laboratories. A variety of needle materials may be used for various functionalities.

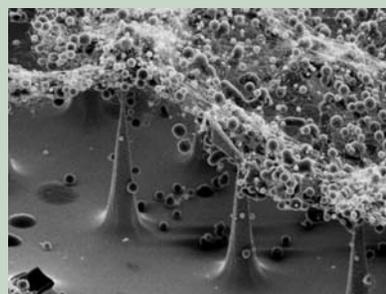
Drug and vaccine delivery by this method is painless and over two orders of magnitude more effective than conventional intra-muscular methods. The technology is currently being developed and patents filed with a view to

Transdermal drug delivery allows improved bioavailability, reduction in side effects, direct cell targeting and painless application. Over 20,000 microneedles per square cm are available using

incorporating Chilton Bioscience early in 2011.

Drug compounds are conventionally applied to the arrays by dipping in the compound, but the majority of active ingredient lies between the needles.

Novel coating technology allows beads and mats of drugs to be applied over the tips of the microneedle array. A significantly lower amount of the active agent is required which reduces the cost of each vaccine or drug patch. This is then delivered by the needles to the antigen presenting cells beneath the skin.



*Polymer fibres and beads coated on to microneedle arrays*

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## Sharing knowledge through partnership

Research and the ideas it create help us to address some of the grand challenges facing the world today including climate change, future energy supply, lifelong health and global food security among others. It is only by sharing the knowledge and expertise born out of research that these problems can be addressed. UK researchers are particularly strong when it comes to working in partnership with business and industry and the following are an example of some of these successes.

### The changing face of music

A small independent record label called FAT NORTHERNER was one of the products of a Knowledge Transfer Partnership (KTP) between the Arts and Humanities Research Council (AHRC) and Birmingham Institute of Art and Design. Among a medley of funded projects, it brought together a frustrated group of struggling independent music labels in Manchester each trying to deal with the changing nature of music. It put them in touch with one another and as a result the record label was formed. Getting together with another group of people to talk about the new face of music, they started Un-convention, now an international phenomenon in the music world. The first meeting was through the Business creation Unit (BCU) in Manchester and the final meeting took place in Mumbai, India where a new music school has been set up.



### Safety saves money

A partnership between Cranfield University and Arriva Passenger Services, sponsored by the Economic and Social Research Council (ESRC) and the Technology Strategy Board, improved bus driver training and safety awareness. The research project led to the development of a simulator for new bus drivers, a psychometric driver assessment, and safety guidelines at bus depots. As a result the company's insurance

claims were reduced by over £1 million, staff turnover was reduced from 24 per cent to 20 per cent, and absenteeism went down from 6.1 per cent to 4.5 per cent. A spinout company is exploiting the commercial potential of the Bus Driver Risk Index, the psychometric assessment of bus drivers' reactions.

## Enhancing technology for stem cell therapies

Geneticists at King's College London are working with UK biotechnology company ReNeuron to explore new methods of developing and implementing novel 'gene expression' systems – the process by which proteins are produced from DNA. The partners' aim is to reduce the time needed to get new stem cell therapies to market. Dr Michael Antoniou, in the Department of Medical and Molecular Genetics at King's, will develop new 'delivery constructs' to enhance the efficiency and safety of ReNeuron's stem cell expansion technology, which is used to grow cell lines. His research builds on previous studies funded by Biotechnology and Biological Sciences Research Council (BBSRC) under the Gene Technologies Underpinning Healthcare initiative.

"We have discovered a novel component that controls one of the first stages of gene expression – a ubiquitously-acting chromatin opening element (UCOE)," says Antoniou. "Placing the ReNeuron stem cell expansion gene under UCOE control will greatly speed up the design of new stem cell lines as research models for a range of diseases." Now with a two-year award, funded through the Government's Knowledge Transfer Partnership (KTP) scheme, the academic/industry research team is working towards new cell therapy products designed to reverse the effects of major diseases such as stroke, diabetes and diseases of the retina.

## Efficient software expertise

e2v Technologies (UK) Ltd is a world leader in magnetron technology and designs and supplies specialised components and sub-systems for innovative technical applications. The Company has its headquarters in the UK and employs around 1,700 people worldwide, with sales turnover of around £233 million (2008/9 figures).

e2v Technologies has long been the UK's leading provider of vacuum tube devices, such as magnetrons, for the efficient generation of radiofrequency (RF) energy. These types of device are required for applications as diverse as defence countermeasures, cancer treatment, industrial heating and television transmission. The Company was keen to explore new design tools and initiated a Knowledge Transfer Partnerships (KTP) through the Technology Strategy Board to transfer magnetron modelling capability and knowledge from

Queen Mary, University of London (QMUL), and create a library of magnetron models exploiting MAGIC software code.

This collaboration, sponsored by the Science and Technology Facilities Council (STFC) successfully introduced new design and modelling know-how into e2v, along with extensive knowledge of the capabilities and limitations of using MAGIC to model magnetrons for RF tube devices. Using the software, e2v has been able to predict the output power and efficiency of a number of magnetron types, and has gained valuable data relating to start-up characteristics and modulator interaction. This information will prove useful when designing new magnetrons, potentially reducing development time and costs. New business is predicted to increase sales by some £12 million/year within ten years.



## Introduction

Sim(u)late, the Centre for Clinical Simulation at the University of Salford delivers clinical and medical education training in an interactive, engaging and realistic way. Using high fidelity human patient simulators has already transformed teaching and research at the University. Sim(u)late now has the potential to offer exciting commercial opportunities to a wide range of health and social care professionals in the public, private and voluntary/community sectors.

## Rationale

There is a gap in the market in Greater Manchester for delivering advanced clinical skills training to a range of interdisciplinary health and social care professions and other organisations that deal with emergency and life threatening

situations. The population is growing and the number of people aged 85 and over has more than doubled since 1983 (Office for National Statistics, 2009). This increasing ageing community will intensify demand for treatment of patients with long term conditions, such as strokes, COPD etc.

## Current status

Sim(u)late have made substantial investment in our simulation equipment and a ward-based facility is already successfully established, with experts in place to deliver the training.

## Benefits to potential users

- Improved clinical and health care skills including communication, team working, critical analysis and decision making skills.
- Practical link between theory and practice in a safe environment, without risk or harm to real patients.
- Meets ethical standards.
- Better patient care, overall improved UK health and a positive impact on the UK economy.
- Prepare delegates for realistic clinical situations involving life and death.



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# Advanced Remanufacturing Technologies (ART) – ‘Engineering software solutions for a sustainable future’

**Team Leader: Dr Winifred Ijomah, University of Strathclyde**

ART is a new company being spun out from the University of Strathclyde to exploit novel research into sustainable engineering practices. A unique computer model of the process of remanufacturing used products has been developed in collaboration with industry. This model allows a company to significantly improve its remanufacturing operations, thereby reducing cost and optimising the engineering process.

The world faces increasing resource use, pollution and waste, resulting in problems such as material shortages, landfill increases, and environmental impacts. International 'Producer Responsibility' legislation now exists to reduce waste, energy and pollution in manufacturing, and to limit natural resources extraction. This penalises manufacturers depending on the amount of waste they produce, and requires them to recover materials from their used products. Manufacturers can meet these challenges by changing their design and manufacturing methods. Remanufacturing allows manufacturers to bring used products back to a "like-new" functional state with a warranty equivalent to a new product, therefore releasing the residual value in the used product's components. Remanufacturing can produce equivalent product quality to conventional manufacture, but at 20-80 per cent cost saving. The current economic value of remanufacturing and reuse in the UK's main industrial sectors is £2.35 billion.<sup>1</sup>

ART's first product is a software system based on the remanufacturing process model. ART will install the software and tailor it for a specific product remanufacturing operation. This will provide financial benefits to the customer through significant cost savings as their process is optimised, waste is reduced and resource use maximised. The customer also benefits from long-term support, with future software updates including improvements to the remanufacturing model. The company will

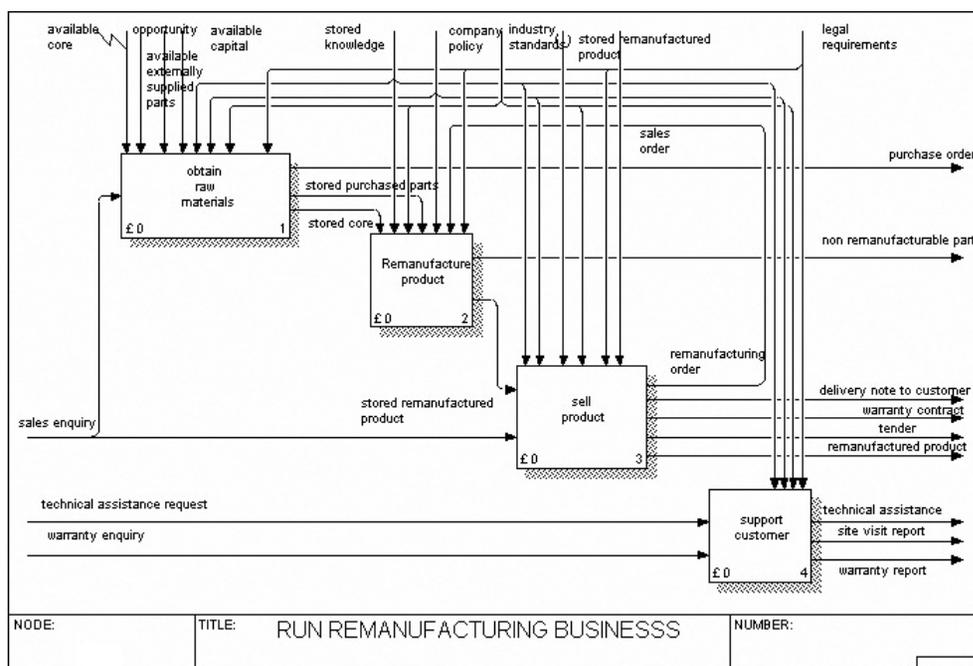
initially target key players in the UK remanufacturing industry in the automotive, defence and heavy industry sectors.

ART's future is to develop the software for use with further sustainable engineering processes, empowering companies to provide eco-friendly manufacturing, while increasing their customer base, brand awareness and profits. Whilst the initial core technology for ART's software is designed for remanufacturing, research is ongoing into the process of designing products for a sustainable future, whether by recycling, reuse or remanufacture. This presents a huge future market for ART and those companies with the key technologies and know-how that ART provides.

ART's core team has worked together successfully for several years. Dr Winifred Ijomah (CEO) is internationally acknowledged as an expert in the field of remanufacturing and sustainable engineering, with over 14 years experience in this area, and is Editor-in-Chief of the Journal of Remanufacturing. She developed the definition of remanufacturing used worldwide, and now integrated into international standards (BSI). Her research into remanufacturing practice forms the background technology for ART. Dr James Windmill (CTO) is an expert in sensor systems and software, with research interests in biomimetics and non-destructive testing.

Investment is initially sought to enable final product development of ART's first software system and finance for ART's business development. Financial predictions indicate that ART will quickly become self-financing. Further investment will then be sought to develop the software suite and broaden the market for ART's product offerings.

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Remanufacturing process computer model section

<sup>1</sup> Remanufacturing in the UK: 2009 Survey, Centre for Remanufacturing and Reuse, December 2009.

# Learning outside the classroom through farm visits

**Team Leader: Frances Harris, Kingston University**

## **A one-day course to achieve cross curricula learning outside the classroom through farm visits**

The proposed business is a social enterprise focused on teacher training workshops to develop outdoor education through farm visits. Farm visits provide an arena in which children can engage in learning in a variety of ways. Teachers report that farm visits present a tremendous learning opportunity, both in terms of personal development of the children, the development of soft skills such as teamwork, and linked to specific curriculum topics. Furthermore, educational visits to the countryside link well with a range of government initiatives aimed at working with school children to promote awareness and understanding of the environment (sustainability, eco-schools), increasing physical activity (tackling obesity, the change-4 life programme) and healthy eating (5-a day). The government, through DEFRA, encourages farmers to host visits and there needs to be a parallel commitment to encourage schools to find farms and make the most of the opportunities available to them.

Recent research (Harris, 2009) showed that teachers who have engaged in educational visits to farms valued the experience and found many ways to link the activity to a broad cross-section of the national curriculum. However, teachers who were unfamiliar with the potential of the countryside as a learning environment were reluctant to arrange visits. This was due to the perceived burden of paperwork in organising a visit and a lack of awareness about the many curriculum links which could be made.

The new focus on learning outside the classroom means it is imperative that teachers are encouraged and supported to make this transition. One-day training workshops, where

school teachers can visit a diverse farm and be shown the potential activities and curriculum links, as well as the relevant preparation (especially Health and Safety), could increase the uptake of educational access to farms (supported by Natural England and DEFRA) and improve children's educational experiences.



This course supports capacity building among teachers and student teachers as the government implements its new initiatives in the national curriculum – compulsory outdoor learning for foundation and Key Stage 1 children, and the promotion of outdoor learning throughout primary education. One-day workshops are offered either as a component of a PGCE course, or as a CPD training day for teachers in service.

This social enterprise is led by Frances Harris, whose unique experience as both an academic researcher on this topic, and a host of farm visits at her family farm means she understands the challenges and rewards of school visits to farms.

Developed after years of research on educational experiences in the countryside, she has developed a one-day course which brings together examples of outdoor learning activities, links to the national curriculum, and the practical and logistical issues relevant to school visits to farms. The course can be delivered at a range of farm locations across the UK.

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# Alba Photonics Ltd – Nanostructured materials for diffractive optics applications



**Team Leader: Mohammad Taghizadeh, Heriot Watt University**

Alba Photonics Ltd is a spin-out company from Heriot-Watt University set up as a result of a Scottish Enterprise-funded Proof-of-Concept project to commercialise innovative technologies in the field of diffractive optics. The company has a strong portfolio of products at various stages of development include anti-counterfeiting holograms, optical waveguides, binary screens and a range of nanostructured materials for diffractive optic applications (including birefringent materials, endoscopy, beam correction for high power diode lasers and security features). The nanostructured platform technology, which is well-suited to mass-fabrication of high efficiency optical devices, has the following benefits:

- Complete design control over the optical wavefront.
- Low volume, optically flat elements with superior mechanical and thermal stability.
- Manufacturing technology well suited to mass fabrication.

Currently Alba Photonics is generating early revenue from technology licensing, sales of binary screens and anti-counterfeiting holograms. The development focus of the company is on bringing to market the nanostructured materials that present a significant market opportunity with potential revenues for high power laser diode beam correction alone estimated at £160 million.

Alba Photonics has developed a patented processing technology to exploit nano-structured composite materials in the design and fabrication of novel lenses and micrometre scale optical elements. This technology enables the ready, flexible and cost effective production of optical elements which current microfabrication technologies cannot produce easily or at all. The optical element is assembled at the macro scale and then is drawn down to the desired size before final cutting and polishing. This fabrication of nanostructured lenses is based on the well established "stack and draw" method used in photonic crystal fibre fabrication.

This is a platform technology with a wide range of potential products able to be produced from it. The inherent flexibility of this nano-structuring approach means that the technology can

be applied to virtually any area where high-precision novel optical functionality is required. The unique selling point of this technology is the fully flexible design and high volume fabrication of novel microlenses and diffractive optical elements (DOEs) which current micro-optical fabrication technologies are unable to produce (e.g. aspheric microlenses), using nano-structured composite materials. The improvements offered by this technology are therefore full flexibility of design and functionality, and low-cost mass production.

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## AmicaGeo



### Team Leader: Alexei Polyakov

The huge recent increase in location-based services and information has created new opportunities for those who can provide more insightful means of data analysis and interpretation.

#### Product offering

AmicaGeo has created a software engine which uses an advanced technique to extract much more meaningful insights from location-based data compared to what can be derived from currently available statistical models.

#### Potential customers

Skout.com, an online dating platform, which enables users to see the profiles of other singles in the same part of town by using their smartphone gps. AmicaGeo's software engine can help Skout to find suitable matches for their users, through the analysis of the patterns and characteristics of their location based data.

Starbucks. AmicaGeo can help retailers such as Starbucks to select the most suitable sites for new stores. Current geographical information systems (GIS) tend to use first order insights by analysing the population density and income levels within an area. AmicaGeo's technique goes a step further by analysing the potential "hostility" of the environment. By doing so, retailers can select a location with the least competitive threats and greatest density of complementary stores.

#### Key attributes

This is a new way to interpret, store and use positional information, which was discovered while studying tissue patterns and organ formation in nature. It is a behavioural rather than simply a statistical model, and so is more efficient, powerful, accurate, and meaningful.

#### The Team



Alexei Poliakov: Graduated with a Ph.D. in Biology from Moscow State University. He won an international travelling fellowship from the Wellcome Trust UK to set up a study group focusing on cell interactions and motility at the UK National Institute for Medical Research. He led an international team of scientists and developed biometrics of cell identity linked to positional information.



Eva Navarro-López: Completed a PhD in Control and Industrial Electronics at the Universitat Politècnica de Catalunya, having graduated with BSc in Computer Science and Physics Systems Engineering (specialisation in Space Dynamics and Celestial Mechanics). She worked at the Instituto Mexicano del Petróleo in México, leading a group focused on modelling, analysis and control of discontinuous dynamical systems. She is currently a lecturer/RCUK Academic Fellow at University of Manchester.



Dave McGeady: Graduated with a first class honours degree in Engineering from Trinity College Dublin, and a master's degree in Industrial Engineering and Management from Helsinki University of Technology. Following this, he spent several years in investment banking with Bank of America in London. Dave is currently completing his MBA program, at both Tel Aviv and Northwestern University (Kellogg).

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## Team Leader: Dr Peter Weller, City University London

### “Improving Patient Outcomes with a Mobile Early Warning System”

ICU-Mobile is an early warning system that alerts mobile clinicians to changes in the vital signs of patients in a high dependency environment via a synthetic index of the patient's health status.

#### Real Time Remote Monitoring

The demands on clinicians are considerable especially for those involved in the care of seriously ill patients in the high dependency environment. Frequently these clinicians have to attend to other tasks, such as ward rounds and case meetings, so immediate contact with patients in their care is lost. Currently pagers and phone conversations are used for staff to contact the clinicians should the condition of a patient deteriorate, but these can be ineffective and only provide information via another person so can be subjective or vague. ICU-Mobile provides a quick and easy way to remotely determine whether the patient's condition has critically changed by providing an alert which bypasses any arbitrary 'bleep and phone' conversation that traditionally exists when an alarm is underway.

#### Solution

ICU-Mobile is a patented solution able to access and quickly translate data collected by any patient monitoring device into a simple, easy to understand alert system. This is a representation of the real time status of patient's vital signs and well being. ICU-Mobile technology provides secure data transfer as no raw patient data is transmitted, therefore removing the need for any encryption of confidential data. ICU-Mobile can be used with a range of mobile platforms and handheld devices such as smart phones and Personal Data Assistants (PDAs).

#### mHealth

ICU-Mobile is part of the remote monitoring market which is a subset of Mobile Health, aka mHealth. mHealth is a broad

category of healthcare market solutions supported by mobile devices, from smart phones to portable imaging devices. The European mHealth market is currently estimated to be worth £1.2 billion and is forecast to grow at a compound annual growth rate of 25 per cent, reaching £3.9 billion in 2014. The US market is predicted to grow to an equal size in the same timeframe. Figure 1 shows the current mHealth value chain with device manufacturers providing platforms for software application developers to implement their solutions, which then utilise the mobile network operators to provide solutions to the healthcare operators, health systems and ultimately patients. ICU-Mobile is clearly targeted in the software application element of this chain. Interestingly mobile network operators are predicted to capture 15-20 per cent of these future revenues, no doubt as the emergence of mass market consumer grade medical devices and software ramp up. This will create unprecedented consumer control and personal responsibility for health, making ICU-Mobile ideally placed to also benefit from this predicted market shift.

#### Commercialisation

The approach to commercialise ICU-Mobile is to license the software to companies in two main categories. Initially to a company(s) providing remote monitoring solutions for patients throughout their journey in an acute hospital, and secondly, to a company(s) providing remote monitoring solutions for patients in their own home, such as those with chronic heart conditions.

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Fig 1: Mobile Health Value Chain, Source: “Mobile Technology's Promise for Healthcare”, GMSA, March 2010



## Team Leader: Dr Mourad Tayebi, Royal Veterinary College

### Overcoming the blood-brain barrier

Many molecules, including monoclonal antibodies, do not pass through the Blood Brainer Barrier (BBB) efficiently, and this is a major problem for drug delivery to the brain. The BBB is necessary to maintain homeostasis in the brain. Few, small, lipid-soluble molecules can diffuse across the BBB, and large molecules are prevented from diffusing into or out of the brain. Active transport of large molecules across the BBB (transcytosis) is possible, via a number of different biochemical mechanisms. In the vertebrate brain, most transcytosis relies on specific receptor-mediated.

### Technology

PrioCam have developed a novel method to generate antibody fragments from camelids (camels, llamas etc.), called VHH domains. The VHH antigen-binding domain of camelid antibodies can fulfil the role of the complete camelid antibody and has a number of unique features.

### Applications

- VHH domain antibodies can be used as a carrier to improve drug delivery across the BBB to the brain. By designing a drug-carrier complex, the aim is to harness the prion receptor-mediated transport to carry drugs across the BBB and into the brain. The complex is unique in targeting the prion-specific pathway. The antibody is called a "carrier" or "Molecular Trojan Horse" (MTH), since the antibody effectively carries the drug across the BBB as if it were disguised as part of the antibody.
- VHH domain antibodies can be generated for specific targets to act as therapeutic agents, e.g. misfolded proteins, such as prion proteins in their alternative conformation (PrP<sup>Sc</sup>) and A $\beta$  proteins, which contribute to neurodegeneration in prion disease and Alzheimer's disease respectively.

### Intellectual Property

PrioCam have two major patents with at least 18 years before expiry:

1. Novel Antibodies and Methods for their Production, filed 08/08/2008
2. Camelid antibodies to act as carriers by conjugation to therapeutic agents, filed 02/10/2008.

### Advantages of camel antibody domains over conventional antibodies

- Small size, more soluble, more stable.
- Target cryptic epitopes.
- Display long, flexible surface loops.
- Able to penetrate cavities in target antigens.
- Display high proteolytic stability (can be administered orally).
- Minimally immunogenic.
- Can be isolated and economically produced as soluble monomers in genetically modified E. Coli.

### Team

Founder and CSO: Dr Mourad Tayebi, an internationally recognised scientist in neuroimmunology, is the founder and Chief Scientific Officer of PrioCam. Dr Tayebi has over 15 years experience in project management and obtaining large project grant funding.

Interim CEO: Michael Simonds has over 20 years of experience in healthcare and is Business Manager at RVC Enterprise, the technology transfer office of the RVC. He previously set up the UK/Scandinavian branch of STEMCELL Technologies and built a very successful customer service, sales and technical support team over seven years.

Company Secretary: Patricia Latter has been Head of Business Development at RVC Enterprise since 2002 and is Deputy Director and Company Secretary of the London BioScience Innovation Centre. She has over 20 years' experience in licensing and spin-out creation in the bioscience sector.

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# FScan – Rapid and Diagnostic Solutions



**Team Leader: Dr Robert Pal, University of Durham**

FScan Limited is an award winning and innovative Durham University spin-out company focused on the development of commercial applications from its luminescent lanthanide chemistry technology platform.

FScan's core competence is in the development of chemically engineered molecular probes (modified lanthanide complexes) for the detection of specific analytes in a wide array of biological fluids. There are two particular commercial fields of application: sensor materials and assays, and medical imaging. The technology platform has four patents filed to protect the IP.

FScan will demonstrate it can deliver a product through its luminescent lanthanide chemistry technology platform in a relevant market where there is an unmet need. FScan currently has three products ready for market development in the measurement of citrate, lactate and urate. Development priority is given to citrate due to the significant unmet need (and large market potentially worth over £350 million) in the diagnosis of prostate cancer, and due to the accepted limitations of the current Prostate Specific Antigen (PSA) measurement systems.

The FScan technology platform has a range of potential applications in a number of different sectors. The key business priority is to deliver a diagnostic prostate cancer product to market by 2012. Prototype instruments have been developed and tested and FScan is now in a position to develop the instrument for commercial use.

The benefits of the citrate assay developed by FScan using luminescent lanthanide technology over conventional enzymic PSA test are:

1. Accuracy (false positives for PSA continue to be a significant problem).
2. Highly sensitive (PSA sensitivities as low as 31 per cent have been reported).
3. Simple to undertake.
4. Small volumes required.
5. Short test time and long shelf life.

In order to commercialise the outputs from FScan, the company is adopting a licensing approach with Partners in different territories around the world. Partners will license applications developed from the technology platform and will sell them into their licensed markets and/or territories. Revenues from licensing deals are forecast in year three.

FScan will develop the product(s) as well as manage the regulatory, manufacturing, supply chain and clinical testing necessary. A number of potential partners have already been identified.

The business objectives for 2010-11 are focused on product development of the citrate application in prostate cancer detection, and the key elements of the 2010-11 plans (and where the expenditure is focused) are:

- Product development activities
- Clinical evaluation activities
- Regulatory approval activities
- Licensee / Partnership activities

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# Holoxica Ltd



**Team Leader: Javid Khan, Heriot Watt University**

Holoxica is an award-winning high-tech startup that has developed a pioneering new "true 3D holographic" display that is commercially viable. The display produces dynamic out-of-screen 3D images suspended in mid-air which can be used to animate a virtual 3D character, similar to an avatar, in applications like kiosks, digital signage, advertising, arcade/gaming machines and vending machines.

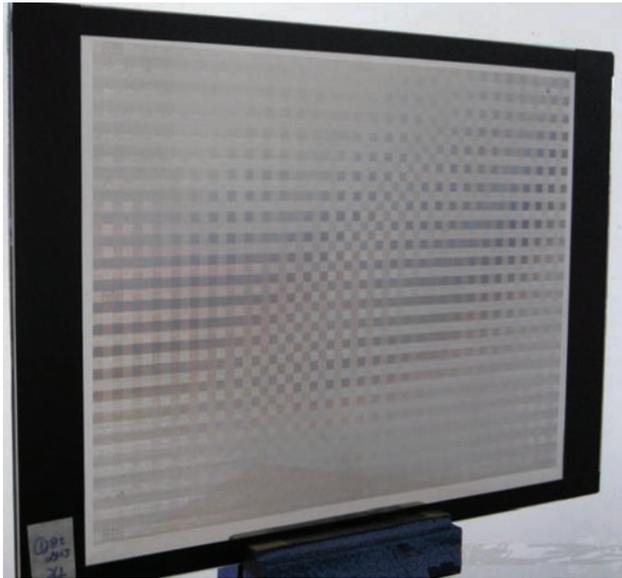
This innovative technology eliminates the need for 3D glasses or other clumsy optical tricks. The images can even be viewed with just one eye. The key differentiator is the so-called "Wow factor" where people cannot help but notice moving colour 3D images floating in thin air. The benefit for the viewer is a comfortable and natural viewing experience without the problems associated with conventional 3D displays. The benefit for customer is potential increased sales of goods and/or services.

The market for low resolution displays is expected to be \$8 billion by 2014 with 6.5 million units sold worldwide. Holoxica will commercialise its 3D technology via component distributors,

display suppliers, system integrators and OEMs. Further revenue growth is expected from licensing to and partnering with producers of stand-alone consumer products (toys, game, clocks and gadgets). Initial revenue will be generated through direct sales of holograms with Holoxica acting as a distributor for a large hologram manufacturer. The company is building the world's first online portal where customers can create their own full colour holograms from 3D models.

Holoxica's display system incorporates a unique intellectual property including one patent pending and more planned. The holographic screen resembles a sheet of frosted glass interacting with lasers on its rear surface to produce simple moving images suspended in mid-air in front of the screen. The prototype screen is about the size of a piece of paper (20x30cm), but could be scaled up in either direction.

Realising true 3D displays has been a challenge for over thirty years, ever since the first Star Wars movie. Various academic and industrial researchers have tried to make a "holo-movie" 3D



projector but failed to achieve this difficult technical challenge. Major competitor activity from Sony, Samsung, and Philips has concentrated on the high resolution (and high price) segments

of the market such as 3DTV and gaming. Holoxica's approach is to start at the bottom with simple low resolution holographic displays and work up towards more sophisticated technology.

The technology has been successfully demonstrated under laboratory conditions and has won several prizes. Holoxica has assembled a world-class, award winning leadership team with a solid track record of high technology development and commercialisation. The company was initially financed by private investors and grants which helped to reach the first milestone with one patent pending and working first generation demonstrators. The company is now seeking early stage investment to make the second generation of display prototypes and achieve initial sales over the next 24 months. The investment will be used to recruit staff, conduct market research, purchase equipment, build up a lab, file more patents and fabricate holographic screens. Investors can expect to see increase in share value as the technology and products develop over the next few years.

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## Youtricity – clean water & energy from waste



### Team Leader: Dr Shanwen Tao, Heriot-Watt University

Using proprietary chemistry, Youtricity is developing the world's first direct urea powered fuel cell technology targeting applications within waste water treatment and renewable energy.

The provision of clean potable water and electricity is a global problem affecting over 2.5 billion people everyday and a lack of clean water is a major cause of death and disease in developing nations. Urea is a solid, non-toxic, mass manufactured industrial fertilizer and major component of human and animal urine however with a world population approaching seven billion individuals each producing around 1.5 litres of urine per day, urea (from urine) is also a major water pollutant and its removal requires a significant proportion of global electrical energy to run wastewater treatment and purification plants.

Youtricity provides water and electricity from waste. It offers an alternative to traditional wastewater treatment solutions operating in a similar manner to a conventional fuel cell where catalyst materials react hydrogen fuel with oxygen across a specialised membrane creating electrical power and water. The Youtricity cell works by reacting urea fuel with oxygen to produce "clean" water and generate electrical power.

Building on low cost, patent pending membrane and catalyst technologies and having demonstrated direct power generation from urea, urine and ammonia<sup>1</sup> in a lab prototype cell, Youtricity aim to capture the urea at source. The first niche market application expected is the treatment of urea rich waste streams to provide power and "clean" water where removal of urea is problematic.

With a 100cm<sup>2</sup> demonstrator planned for May 2011, Youtricity will offer a first generation product for water and effluent treatment systems for home use, remote communities, emergency situations or stationary & mobile power.

Parallel applications exist in transportation where a global fuelling infrastructure already exists through urea solution increased use as the NOx reducing additive of choice for heavy goods vehicles (e.g. Adblue®). Future generations of the Youtricity Fuel Cell will offer a non-toxic, low cost, easily transportable viable alternative to the high pressure, highly flammable hydrogen gas or the methanol used in today's fuel cells.

Funded by an Engineering and Physical Sciences Research Council (EPSRC) Follow on Fund grant the Youtricity team are optimising the Youtricity Fuel Cell in preparation for further investment to enable company formation and market development or commercial exploitation through technology licensing to one or more existing OEM partners in the waste water treatment or fuel cells market.

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<sup>1</sup> "A Direct Urea Fuel Cell – Power from Fertilizer & Waste", Lan et al., *Energy & Environmental Science Journal*, 2010

# RE-POP Ltd – Renewable Energy, Power Output Prediction

**Team Leader: Dr Jim Halliday, STFC Rutherford Appleton Laboratory**

## Business Opportunity

Many countries have passed legislation that commits them to supply 20 per cent of all their energy from renewable sources by 2020. The UK will have to generate approximately 40 per cent of its electricity from renewables if it is to meet the 20 per cent threshold whilst in Europe the figure is 34 per cent. All renewable energy sources fluctuate according to changes in the weather and environment. RE-POP (Renewable Energy – Power Output Prediction) is a suite of models which deliver real-time, short term predictions of the output from renewable energy plants.

## Benefits to Potential Users

At renewable energy generation levels above 2.5 per cent, the accurate prediction of the energy generated becomes important from operational scheduling, energy pricing and energy trading perspectives. These are three areas that define the potential customer base for RE-POP's service:

- **Wind Farm Owner/Operators:** Wind farm owner/operators using RE-POP will be able to sell, with confidence, their electricity in advance of its generation and secure a better price.
- **Power Companies:** RE-POP gives power companies a tool that they need to reduce their imbalance risk with the grid operators.
- **Grid Operators:** RE-POP enables grid operators to manage more efficiently the integration of wind generated electricity with their current portfolio of traditional electricity generators and so reduce costs.
- **Energy Traders/Hedge Funds:** RE-POP enables energy traders and hedge funds to trade more profitably in the over-the-counter electricity markets.

## Business Proposition

RE-POP has already developed a product that forecasts the electrical power output generated by wind turbines at wind

*The Hornes Rev wind farm*



farms. The software uses meteorological information and novel algorithms combined with an intelligent system that, over a few weeks, learns the effects of different wind strengths and directions on individual turbines, thus giving enhanced prediction accuracy.

The product offers customers a flexible, low risk, low cost solution that provides improved personalisation, forecast accuracy and reliability, with output tailored to the user's specific requirements.

## Route to Market

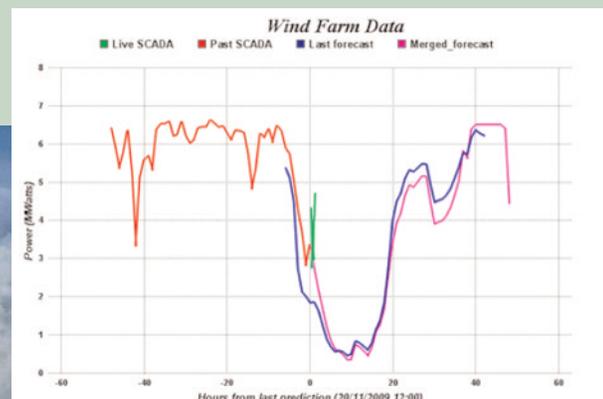
There are two possible sales strategies for RE-POP. Firstly, to build a sales team and sell directly to the end users, or secondly, to sell the service via a third party. RE-POP has already been demonstrated at a national scale and is currently carrying out a real-time forecasting trial.

## Intellectual Property

The novelty in the idea lies in the forecasting model design and software, protection which will be enforced through the end-user license to use the models. The copyright and confidentiality in the software lies with the RE-POP.

## Finance

RE-POP is in a strong position to sell its wind power prediction services into a global market that is expanding rapidly and will continue to do so for at least the next five to ten years. The company's five year forecast earnings before interest, tax, depreciation and amortization totals: £16.5 million in the best case; £1.95 million in the worst case; and £5.39 million for the most likely outcome. RE-POP requires a modest amount of investment to facilitate the company's launch into the wind power energy market and to secure the services of a commercial management team.



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## Team Leader: Chris Spindloe, STFC Rutherford Appleton Laboratory

Over the last 50 years, since the birth of the laser, significant research effort has been invested in developing new laser technologies, to achieve shorter pulse-lengths, higher energies, faster repetition rates and higher average power systems and thus create extreme physical environments. In order to harness the power of the resulting plasma physics for real-world applications in fusion energy and cancer treatments, there are two important factors, the laser itself and the tiny "targets" or "samples" which interact with the laser beam and determine the subsequent reaction. Surprisingly, despite offering a cost effective way to tailor the science of the reaction, there has been much less interest in developing this capability alongside the lasers themselves.

The Central Laser Facility at the Science and Technology Facilities Council (STFC) has invested heavily in target fabrication in the

This is a rapidly expanding global market. There are currently more than 50 national-scale laser facilities worldwide and this number continues to grow through the commercial availability of high energy laser systems and the building of bespoke facilities to address specific applications of this science sector.

The team have unique experience in designing and manufacturing targets which can be used to create the desired scientific outcome of a laser experiment.

Traditional assembly techniques used to create millimetre and larger scale devices cannot usually be scaled to smaller items, because other forces (e.g. friction) have more significance when dealing with smaller components. There are complex issues around the handling of components on this scale (their small size makes them inherently delicate) which are not well understood by those used to engineering on the meso or macro scale.

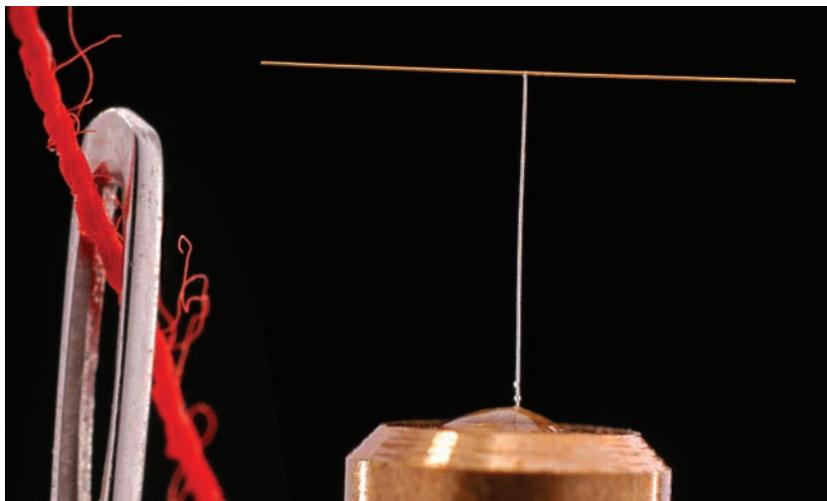
Working with multi-material devices which combine metal, plastic and semi-conductor elements exacerbates these problems further.

Scitech Precision combines expertise in micro design, assembly and engineering with intimate understanding of the physics of the lasers to deliver bespoke engineering solutions on the sub-millimetre scale. Scitech Precision's IP portfolio consists of a library of over 50 target designs and manufacturing processes which form the secret know-how of the group. All existing designs and processes will be exclusively licensed from STFC to the company and will not be commercially available through any other route.

The long term goal of the company is to be a centre of excellence for micro

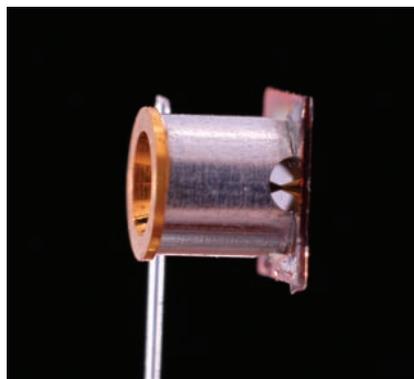
assembly and be established as the premier supplier of targets for the particle beam therapy cancer treatment centres, and laser driven fusion power stations of the future. By being intimately involved from the early research phases of the application driven research into these fields, through the development phases and the demonstration of the first

commercial facilities, Scitech Precision will be uniquely placed as the established partner to supply these high volume consumables to the power stations and hospitals of tomorrow.



Targets are made from components smaller than a human hair. Photo shows a Z-pinch target (T-wire) with threaded needle to demonstrate the scale.

past decade, and has brought together a highly skilled team with extensive experience in the manufacture of these assemblies. The team propose to create a company, Scitech Precision, which will capitalise on this unique knowledge and establish a centre of excellence for multi-material micro assembly in the UK.



Typical products include a gold cone and plastic shell (left) for fusion research and a thin foil on an aluminium assembly (right) for generation of particle beams for cancer therapy.

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# smartLAS: designer ultrashort pulses

**Team Leader: Dr Nikolaus Klaus Metzger,  
University of St Andrews**



## Who we are

smartLAS is a laser and optics company aiming to provide a truly multipurpose ultrafast laser platform by offering unmatched versatility via enhanced and automated pulse parameter control with high reliability. This patented laser concept has been developed within the Ultrashort Pulse Research group at the University of St Andrews and is grounded in biomedical, spectroscopy and laser machining applications.

The idea behind smartLAS is driven by the high demand for reliable turnkey ultrashort laser systems as their applications grow into markets not populated by laser specialists. One of the major disadvantages of current ultrashort laser systems is the expert knowledge needed to keep the laser operational at the required specifications. The design of ultrashort laser systems has not advanced appreciably and this has led to the development of external add-on products, procured from third-party suppliers, thereby making laser systems more complex. Customers who wish for additional versatility are facing additional costs and are dealing with several suppliers, which further increases servicing costs and complicate fault finding and handling.

In contrast, the smartLAS approach enhances the versatility of the laser itself by directly producing from it the pulse characteristics that are required. smartLAS aims to be the first company to bring this laser concept to the global \$300 million ultrafast laser market and has forged links with high profile biomedical research groups as well as the global microscope industry to exploit new market opportunities.

## Our products and services

smartLAS caters for inexperienced laser users such as biologists or engineers who are looking for a versatile optical tool that provides an adaptable and complete solution to their work. smartLAS offers a novel, ultrafast laser system and an upgrade service for customers who already own an ultrafast laser. Key functionality features and benefits to the user include:

- **Switching between constant intensity (cw) and ultrashort-pulse regimes.** During cw operation visual beam piloting, optical probing or tweezing can take place. When direct interaction is required pulsed operation is initiated at the push of a button.

- **Pre-compensation of dispersion** maintains superior operational parameters independent of the parasitic influences of an optical system to ensure that the highest quality pulses are available at the application site.
- **Automatic optimisation** of the overall laser parameter space allows the optimisation previously carried out by a laser specialist or service technician to be conducted by a novice. This eradicates expensive downtimes of processes and reduces running costs.
- **Pulse phase control** allows the user to imprint a designer phase relation onto the wave packet.
- **Easy accessibility.** Uniquely smartLAS offers integration of products into measurement and control equipment already used in experiment. The single solution control panel is accessible remotely over the World Wide Web with an internet browser.

## Contact

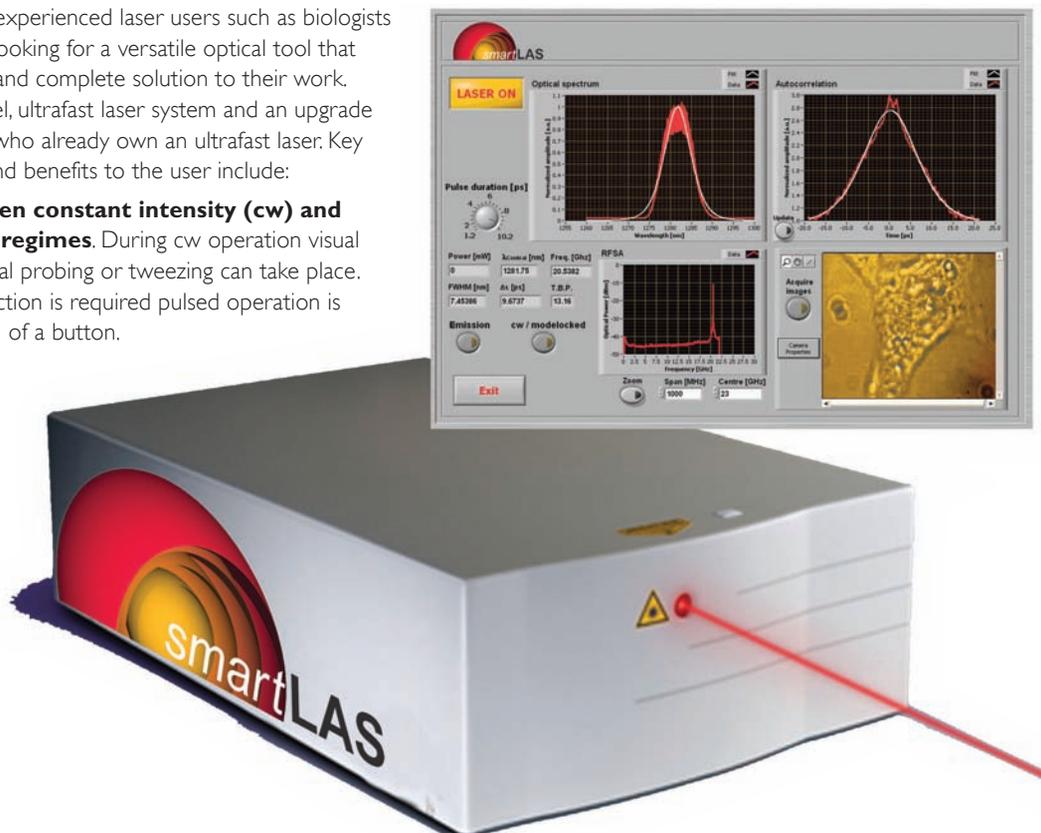
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Figure: Example internet based GUI – spectral and temporal pulse characteristics are measured and automatically fitted. The experimental outcome can be observed via an integrated camera.



## Team Leader: Professor Stan Heptinstall, University of Nottingham

The team behind Platelet Solutions are Professor Stan Heptinstall, Dr Sue Fox and Mrs Jane May of the Division of Cardiovascular Medicine of the School of Clinical Sciences, Faculty of Medicine and Health Sciences at the University of Nottingham. Collectively they have many years of experience of research on platelets, important blood cells involved in thrombosis. The team want to use this experience to provide better healthcare for patients who receive anti-platelet therapies to reduce the risk of thrombosis and thereby the threat of heart attack or stroke. They have developed simple-to-use blood testing test kits that can measure the effectiveness of anti-platelet therapies and guide subsequent treatment.

Every year some 1.4 million people in the UK alone exhibit symptoms of cardiovascular disease and are therefore at-risk of a heart attack or stroke. Heart attack and stroke are the primary causes of mortality and morbidity worldwide. Large numbers of such patients are treated with anti-platelet agents, especially aspirin and clopidogrel, which are taken daily to prevent a thrombotic incident. In England alone in 2009 there were 39 million prescriptions for antiplatelet agents. Unfortunately, however, sub-optimal treatment is common and existing commercial approaches to check on the efficacy of treatment are costly, complex, and time consuming and have only limited applicability.

For the first time, Platelet Solutions are able to offer a simple approach to find out whether treatment is optimal or not. Armed with this information the doctor can be reassured that the prescribed drugs are fit for purpose, or adjust the dose of the medicine, or prescribe one of the newer, better medicines that are becoming available.

The team have developed simple-to-use kits which are unique in that they require no specialist equipment and can be undertaken in any healthcare or community setting. The kits contain all that is needed for a test to be performed on a small blood sample immediately after venepuncture. The sample is then posted to a quality-controlled central laboratory for analysis, and a report is produced. The approach utilises measurement of P-selectin on activated platelets using flow cytometry. The IP is in the fixative which stabilises the P-selectin for up to nine days and for which an international patent application has been filed.

The tests will provide a simple-to-use means of monitoring the effects of anti-platelet drugs, especially in the chronic care setting, and will provide for the growing demand for "individualised medicine" in patients with cardiovascular disease.

Platelet Solutions will form a spin-out company that will manufacture and distribute kits and establish the market. Kits for aspirin and clopidogrel are already available and the platform technology provides for further kit development. The company's Board will include the three inventors as executive directors together with a CEO to be identified. It is proposed that Platelet Solutions will sub-contract the manufacture and distribution of the kits to a SME, and the director will also join the Board.

The company estimate that over five years and with initial funding of £530,000 total sales will reach £11.8 million at a year five GP of 69 per cent. It is anticipated that the exit at year five will be via a trade sale.

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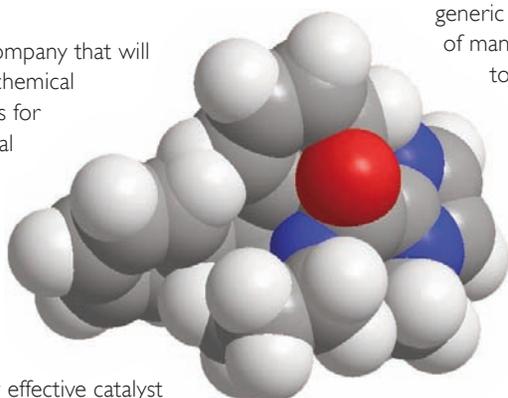


The inventors in the central laboratory where the blood samples are analysed using flow cytometry

## Team Leader: Dr Simon Jones, University of Sheffield

### The Company

Catalyx is a spin-out company that will provide cost effective chemical manufacturing solutions for the preparation of chiral amines, a class of active pharmaceutical ingredient (API) with estimated annual sales of over \$22 billion. The key to this is a new and highly effective catalyst system developed within the University of Sheffield that is easy to prepare, very cheap to operate and provides unprecedented levels of efficiency and selectivity compared to other catalysts in its class. The business strategy is to develop and sell new manufacturing processes incorporating the Catalyx proprietary technology. Initial investment is sought to secure the company's first revenues from development by sales of data packages detailing these processes.



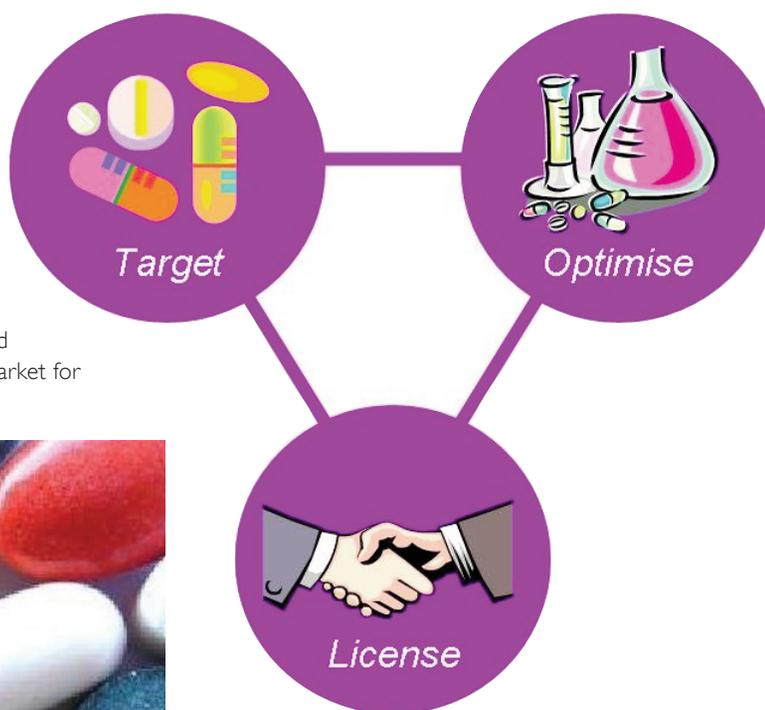
generic drug provision will continue to expand since the patents of many brand-name API's are due to expire in the next three to five years.

### The Strategy

Catalyx has already identified and targeted key API's on the basis of their existing patent protection and development phase, and their relationship to the chemical structures of substrates already evaluated. The company will develop bespoke optimised manufacturing processes and comprehensive data packages for those API's where the Catalyx process significantly undercuts the applicable platform technology, so that this iterative cycle of development, data package preparation and out-licensing, can be repeated for many classes of API at the appropriate opportunity in their development lifetime.

### The Market

The huge expense associated with bringing a new drug candidate to market means that a cost effective solution for bulk scale manufacture of any API is required. Increasing pressures on global healthcare provision has seen a rapid rise in the sale of generic API's, with suppliers searching for alternative, cost effective and competitive manufacturing processes. The global market for



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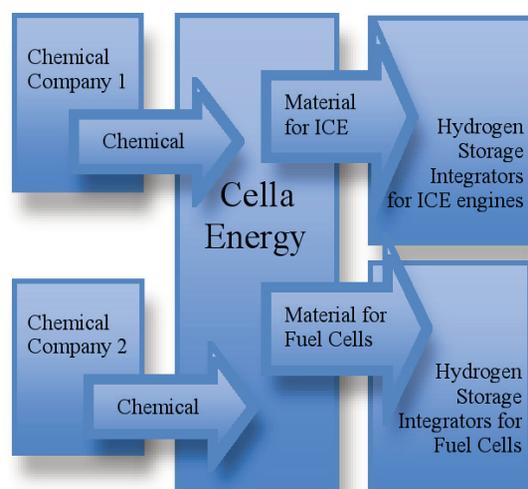
# Cella Energy

## Team Leader: Professor Stephen Bennington, Science and Technology Facilities Council (STFC) ISIS

Cella Energy has discovered a low-cost, safe way to store hydrogen for use as a clean, carbon-free fuel in the transport sector. It is the fruit of collaborative research between the Rutherford Appleton Laboratory and University College London.

The future of transport will ultimately be electric. Lithium-ion batteries are the current standard, but a hydrogen store plus fuel cell can provide four times the range. However both are currently too expensive to be fully commercialised. For its demonstration project Cella Energy is planning to use an internal combustion engine that has been converted to run on hydrogen.

A patent has been filed on a low-cost and scalable method for creating fibres of hydrogen storage material encased in a



hydrogen-permeable plastic. These form a fine tissue-like material that is safe to handle in air and contains as much hydrogen for a given weight as the high pressure tanks.

The company aim to develop partnerships with chemical companies to do the bulk manufacture and then sell the product to companies such as automobile manufacturers who want to incorporate these materials into prototype vehicle fleets. The company will develop and improve products and maintain quality control and testing.

Existing prototype hydrogen vehicles use tanks of hydrogen stored at very high pressures. Although these technologies work, they raise considerable safety, regulatory issues that will make their adoption as a consumer product problematic. The Cella Energy product makes it possible to store hydrogen safely at low pressures.

The company's main competitors are not fossil fuels, but other hydrogen storage solutions and lithium-ion batteries. In terms of vehicle performance hydrogen easily outperforms existing battery technology, and beats it on price. Other hydrogen storage technologies exist but the Cella Energy technology has significant advantages, arising partly from the nanostructure and partly from the plastic encapsulation:

- operation at pressure and temperatures that are close to ambient,

- can be handled in air;
- sufficient hydrogen density,
- rapid hydrogen release,
- supply of clean hydrogen.

Cella Energy has already secured £300,000 venture capital to start the company and continue the material development and is seeking £2 - £5 million to develop the company to the point where it is able to licence the manufacture of the product in bulk.

The company is made up of a team with wide commercial and scientific experience:

### CEO: Stephen Voller

Considerable experience as a CEO raising capital for start up companies in the hydrogen fuel cell and automotive sectors.

### Chief Scientist: Prof Steve Bennington

Head of a world-class scientific team from the STFC and UCL. Visiting professor at the London Centre for Nanotechnology.

### IP Strategy & Product Development: Dr Anke Lohmann

Engineering Physicist at De Beers, Product Design at PDD, and instrument Development at UCL.

### Technical Expert: Arthur Lovell

Expert in electrospinning and hydrogen storage



The team, left to right: Anke Lohmann, Stephen Voller, Arthur Lovell and Steve Bennington

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## Innovation and business success

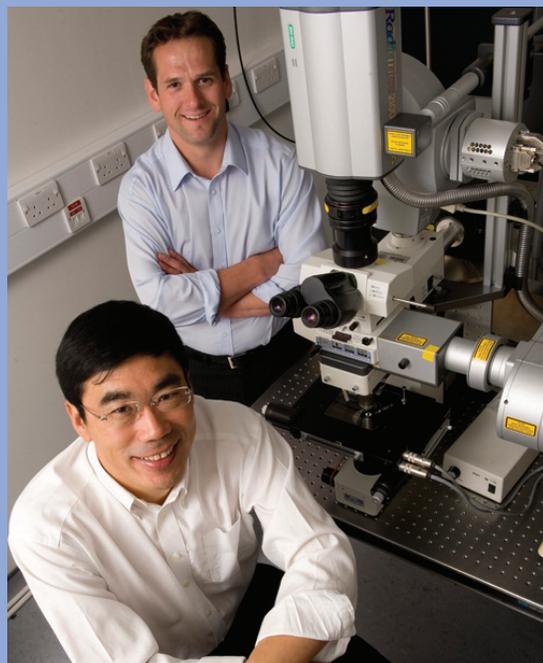
The strength of the UK research base attracts business and industry from around the world to work in partnership with researchers from higher education institutions across the country. A measure of the success of such partnerships can be seen in the variety of case studies about research innovation being adopted by business and industry and the success of spin-out companies. The following are a small sample of some of these success stories.

### Pharmaceutical innovations

Oxford University has an excellent reputation for translating innovative research into successful spinout companies through Isis Innovation, its wholly-owned subsidiary founded to exploit know-how arising out of research at the University. It has identified the need for broader sources of venture capital and has been actively seeking commercial investment from overseas.

A recent spinout is Zyoxel, a company that is commercialising microbioreactor technology to improve drug discovery and stem cell culture. It is estimated that Zyoxel's TissueFlex microbioreactors can reduce the average cost of drug development by at least 10%, improving accuracy and time-to-market.

The technology has the potential to detect toxicity at an early stage of drug development that could save the pharmaceutical industry around \$8 billion per year. Zyoxel recently secured £1 million investment from Hong Kong multinational CN innovations Holdings. The funding for the original research for this technology largely came from the Biotechnology and Biological Sciences Research Council (BBSRC).



### Carbon-negative cement attracting investment

A spin-out company whose early research was supported by a £98,000 Engineering and Physical Sciences Research Council (EPSRC) grant has raised £1 million in equity investment, including the first investment for the Royal Society Enterprise Fund. NovaCem Ltd produces carbon negative cement, a potentially revolutionary material for the construction sector and environment, given that the most commonly used cement, Portland, is a notorious producer of CO<sub>2</sub>.

A collaboration between Cambridge University, Imperial College London, and various industrial partners including TecEco aimed to investigate the claims being made about the properties of TecEco cements. During experimentation an

alternative cement system was discovered based on magnesium oxide and which did not contain Portland cement. In 2007 NovaCem Ltd was formed to commercialise the MgO-based cement technology.

In 2008, NovaCem was awarded the one-year EPSRC grant to further develop carbon negative products and now leads a £1.5 million technology strategy Board project to optimise the MgO production process at a laboratory scale followed by a demonstration at a pilot plant scale. The project partners are Imperial College, Rio Tinto Minerals, Laing O'Rourke, WSP Group and NovaCem.

## Optical insights

A new type of microscopy has revolutionised the way scientists look at specimens such as embryos. The technique, developed and commercialised by the Medical Research Council (MRC), produces 3D images that give unprecedented insights into the structure of tissues and the activity of genes.

Optical Projection Tomography (OPT) was invented in 2001 by Dr James Sharpe, a MRC molecular biologist working at the MRC Human Genetics Unit in Edinburgh. MRC's technology transfer company, MRC Technology, helped develop the patent for OPT and to set up Biotronics, an OPT scanning service. The Edinburgh group is now

collaborating with scientists all over the world, using OPT for a variety of applications, including mouse embryos, plants and, increasingly, organs of adult animals.

OPT has been described as a 'disruptive technology', which is one that revolutionises an existing technology. MRC Technology and scientists have been testing, marketing and selling a commercially viable OPT instrument, oPT3001, and by October 2007 13 instruments had been sold in eight countries. The technology has the potential to be taken up by a major manufacturer with the expertise to maximise OPT's commercial value and to market it around the world.

## Collaboration with the reinsurance industry

Natural Environment Research Council (NERC) researchers are collaborating with the reinsurance industry to exploit the potential of high resolution climate models to develop catastrophe modelling in the reinsurance industry. This will ensure reinsurance companies are not unknowingly accumulating risk that could lead to large losses and destabilise the industry. It is estimated that if this led to only a 5% reduction in average insured losses due to storm damage, this would be worth between £62-130 million per annum to the UK insurance industry.

One such collaboration is the Willis research network. Willis re is one of the 'big three' reinsurance brokers. It provides funding of around £2 million per annum for postdoctoral research fellowships and PhD students at partner research

institutes. One measure of the economic impact of this research is the willingness of Willis re to use its resources to 'pull through' academic research into practical applications in the insurance industry.

For Willis re, the UK is the best place to fund research because of a unique combination of factors: global position, excellent science at reasonable costs, proximity of research institutes, global outlook of UK researchers and the ability to be flexible and assimilate knowledge. This will help the UK to maintain its competitive position as a centre for reinsurance and support growth in the future.

More information about these and other research case studies can be found at [www.rcuk.ac.uk](http://www.rcuk.ac.uk)

# Farmware Ltd – Automated Measures of Animal Welfare



## Team Leader: Marian Dawkins, University of Oxford

### Business Idea

The aim is to improve the welfare of intensively kept broiler (meat) chickens using a computerised camera system that remotely monitors welfare on commercial farms. The system detects disturbances in the 'optical flow' patterns of chicken flocks (similar to disruptions to traffic flow) that have been shown indicate good or poor welfare in individual birds. As this is done automatically and in real time, the system fills a major gap in the market and opens up the possibility of assessing farm animal welfare on a scale that has been quite unimaginable before.

The system provides objective evidence about animal welfare that will benefit farmers, retailers, consumers and anyone who cares about where their food comes from. Farmers using the system can add value to their chicken by selling it as a high welfare product. It also has the potential to help them manage their flocks more effectively, to cut production costs and to save on labour. The importance of this system is that it provides the objective evidence to consumers and retailers that high welfare

claims from farmers are justified. Welfare auditors currently have to visit farms in person, giving only a single 'snapshot' of a farm on one day. Farmware's technology is able to assess the state of a flock continuously, day and night, throughout its life and so will help companies demonstrate to their customers that they are fulfilling the welfare part of their Corporate Social Responsibility (CSR).

### Route to Market

The route to market will be through a consultancy business (Farmware Ltd.) that provides a service to retailers, chicken producers, food outlets and other clients by running research trials for them. Large food companies increasingly want their decisions about animal welfare, food production and food safety to be 'evidence based', but do not have the expertise to run their own trials to obtain their relevant evidence. Farmware Ltd would undertake to plan, set up and run trials for them, using our expertise in running commercial trials and their unique system for measuring welfare to deliver high quality evidence.



Russ Cain



Stephen Roberts



Marian Dawkins

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# EastLondonLines



## Team Leader: Angela Phillips, Goldsmiths, University of London



EastLondonLines is an online news portal established by staff at Goldsmiths, University of London, to fulfil the need for local independent news. Over the past year the Newspaper Society has

estimated that over 100 titles have closed (Witschge et al 2009) and revenues online are far smaller than in print. Mergers are common. Seventy per cent of local newspapers are now owned by only four companies and jobs for newly trained journalists are scarce. EastLondonLines intends to use this threat as an opportunity both to demonstrate how independent local news could become viable and to provide a franchisable model for

other university journalism departments and community organisations.

Journalism colleges already have the potential for producing high quality content for at least part of the year, which brings down the cost of the service. If they are able to attract revenue for the other half of the year, when students and staff are not available, they could provide high quality first jobs or paid work experience in the initial months after graduation for promising graduates and give them a first step on the career ladder.

The core problem for on-line services is the difficulty of raising advertising revenue. There is clearly a big opportunity for local businesses to make use of a well-produced site with high local traffic as a means of attracting customers. The difficulty for small news organisations lies in the amount of time and expertise required to find and sign up advertisers. For a very small organisation the costs of attracting advertising are so high that they out-weigh the benefit to the organisation, and eat

into the potential for employing the journalists who produce the content.

EastLondonLines is well placed to operate as a test-bed for a range of funding ideas, all of which should provide modest income streams without recourse to highly-paid staff dedicated to selling advertising space. The company has excellent contacts with alumni working in on-line businesses who can give advice, as well as a close connection with a major inter-active company. The company is operating in a very fast moving sector and need to be able to leverage their first mover advantage. The plan is to establish EastLondonLines and then franchise a technical solution to small websites that would allow them very easily to monetise

their news sites, taking advantage of their ability to produce rich local content. This is not merely a business proposition, but a possibility for increased local democracy. The profit would lie, not so much in gathering franchise fees but in ensuring that local news and local news jobs do not disappear in the shake-up of media systems that we are currently experiencing.

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## goHDR

**Team Leader: Alan Chalmers and Kurt Debattista,  
University of Warwick**



*Under-exposed*



*HDR*



*Over-exposed*

High Definition(HD) television is not the ultimate because what we see on the screen is much less than the natural capability of our eyes. HD cannot display extremes of light and darkness, known as dynamic range. High Dynamic Range (HDR) television, in combination with HD and 3D techniques, can do so and is thus "the ultimate technology".

The pictures above show the technique for still pictures. The under-exposed picture shows the scene outside the room clearly, but inside the room, much detail is lost. The over-exposed picture is the converse. HDR combines these to show

both. It is more natural as it has the full range of our eyes (20 f-stops) which cameras are unable to capture.

goHDR is at the leading edge of this new HDR television, and is building a business around proprietary data-compression techniques, which are ideally suited to handle the large data requirements of HDR television. We have access to the first and, to date, only true HDR video camera system in the world (20 f-stops), and an exclusive licence to a patent describing a method of compressing a stream of HDR video by 100-fold or more. goHDR's encode/decode methods have the potential to become one of the major enabling technologies for the widespread adoption of HDR technology.

A Limited Company has now been established and includes an impressive list of directors and advisors. Three grants have been won, and the company are receiving investment offers. The first software products are now being developed by in-house staff and by sub-contract and the company expect to launch the first product before the end of the year. A corpus of HDR films are also being created to be used for testing and promotional purposes.

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# Intelligent drowning detection system

**Team Leader: Princy Johnson, Liverpool John Moores University**

## **Demand**

According to the comprehensive study conducted by the U.S. Consumer Product Safety Commission (CPSC), each year on average, 350 children under-five years of age drown in swimming pools, with most deaths occurring in residential settings. The research also indicates that only 30 per cent of bathers in trouble are spotted within 30 seconds, with two-thirds of the subjects being spotted in more than a minute. EU regulations stipulate that owners of private pools have to install pool safety devices to prevent accidental drowning.

The current pool alarm devices are designed to alert when an entry is made into the pool, or only when a subject has been on the pool floor for a length of time. This means that when the pool is in use, the alarm has to be disabled thus compromising the safety of children during that time or the alarm may not be raised for several crucial minutes. There is no single product on the market that would detect the drowning motion of a subject.

## **Product outline**

The proposed product aims to prevent drowning by constantly monitoring for distress movements made by a drowning subject under water and sounding alarm at an early stage. The product will consist of two stages of sensing/detection. The first stage will enable the system to tag onto the subject to be monitored when the subject enters the pool. This stage will also act to eliminate any false alarm. The second stage will monitor the subject for any drowning motion and will sound an alarm when that occurs. The proposed product will use well developed, existing technologies for each stage of the sensors and signal processing.

## **USP**

The Unique Selling Point of the proposed product is that, it is aimed to detect drowning motion of a subject. The advantage of this product over the existing systems is that

sophisticated drowning detection method is achieved using simple and reliable technologies.

## **Target market**

The target market for the proposed product will be the owners of private pools in their homes. According to USA Swimming and the National Swimming Pool Foundation there are 10 million Swimming Pools in the United States alone. Marketing activities will include attendance at key exhibitions and direct dialogue with suppliers such as Poseidon systems.

## **Current status**

A patent application for the proposed system is currently being filed at the British Patent Office by Liverpool John Moores University (LJMU). Funding to cover the costs to employ a researcher to work on the product demonstrator is being sought from the University. If funding is made available in autumn 2010, the prototype will be built and tested by summer 2011.

During the prototype development stage, a limited company will be incorporated with Dr. Princy Johnson and selected staff from the Business Development Centre at LJMU as management team. During the final phase of prototype development, the management team will carry out marketing activities. The standard practice within the University is to sell the licensing to appropriate major supplier of similar products.

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# TacMap™ – The World at Your Finger Tips



**Team Leader: Professor Paul Chamberlain,  
Sheffield Hallam University**

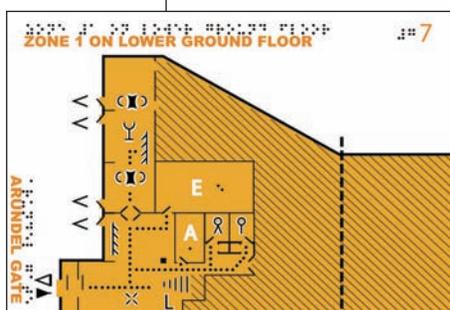
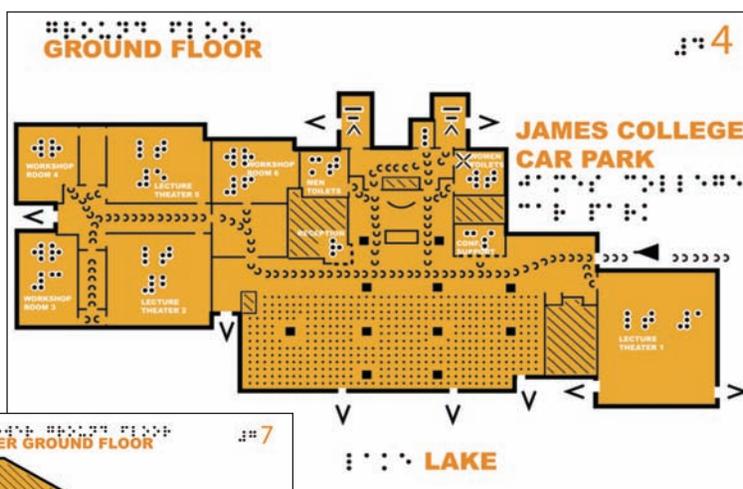
All photos courtesy of Patricia Dieng



"TacMap™" is a novel and simple software solution that produces tactile maps to enable blind and partially sighted people to navigate their way around indoor spaces enriching their everyday life. It helps the visually impaired to acquire information about how a building, an individual floor or a room is laid out. TacMap™ can represent a wide range of buildings and venues such as hotels, museums, theatres, bus and train stations, transport hubs and leisure complexes or places where they work. TacMap™ has been developed by Patricia Dieng and Professor Paul Chamberlain of the Art and Design Research Centre at Sheffield Hallam University in collaboration with Zychem Ltd.

The tactile language developed comprises of a palette of textured symbols representing entrances, exits, and fire exits, directions of door openings, receptions, toilets, stairs, access ramps, and evacuation points. This information is usually acquired by asking the help of a sighted person. Many current visual signs and symbols cannot be interpreted clearly through touch and the research team have developed new symbols to add to the icon based language.

TacMap™ software allows the user to produce effective and intelligible maps for visually impaired people at a reasonable cost. Once created on screen, the maps are then printed on reactive paper and then heated to produce the tactile surface. Buildings have now the opportunity to be equipped and to offer their blind visitors, guests or clients detailed maps



to support their visit and at the same time satisfy the duties under the Disability Discrimination Act (DDA).

### Current status

Substantial user trials have been completed, with extremely positive outcomes at Sheffield Hallam University in 2009 and at the Millennium Galleries in Sheffield in 2010. These field trials supported the development of the tactile map by understanding:

- how blind people perceive the information by touch,
- how they figure it in their mind,
- and then interpret it to navigate, orientate themselves within spaces.

TacMap™ can overcome the limitations of satellite navigation systems and has been praised by users for giving a better sense of the environment than using voice direction. TacMap™ does not impede environmental sounds such as doors opening, escalators and lift noises or talking, which helps to provide a greater sensory experience of the user's location. The proposed A4 size of the tactile booklets makes it handy to carry around and can be used alongside talking GPS, white canes and guide dogs.

Copyright, Trade-marking and Brand development will ensure that this revolutionary product will be protected and positioned as a premium and preferred product.

"I'm familiar with the Sheffield train station but things change, and there are certainly a lot of things I don't know are there, I have walked passed it hundreds of time and I'll never know it's there, like the main reception and the lift here at the Millennium Galleries. To have something like this would be very good."

— **Euin Hill** (registered blind)

"This is wonderful, this illustrates so many things; plans are really useful." — **Julie Smethurst** (registered blind)

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# DIOS – Directly Inscribed Optical Sensors for Structural Monitoring Applications



**Team Leader: Dr Graeme Brown, Heriot-Watt University**

A recent Federal Government report estimated that one in four of the 600,000 bridges in the US is 'structurally deficient'. A large proportion of the maintenance costs are spent on ongoing periodic inspections. This is just one example of where Structural Health Monitoring (SHM) can be applied to reduce costs and increase safety. By fitting sensors at various points on the structure which are centrally monitored, a more accurate estimation of the structure's condition can be assessed. This in turn allows for more efficient planning and targeted maintenance programme. Optical sensors are increasingly used rather than conventional electrical sensors as they have significant advantages.



The global fibre optic sensing market was estimated to reach \$1,450 million in 2008, growing at an average annual growth rate of 23.5 per cent. The fibre sensor market is still young and companies are eager to explore new applications and develop bespoke products. In addition to bridges, optical sensor systems are increasingly being used to monitor wind turbines, aircraft and underground mines.

DIOS is a Proof-Of-Concept project funded by Scottish Enterprise which has developed a new type of optical interrogator to monitor remote optical sensors. Using the technology of laser inscription compact, integrated, optical devices can be 'written' into small glass chips. The key drivers for manufacturing interrogators in this way are:

- Low cost, integrated design.
- Efficient, scalable manufacture.
- Compact, robust and lightweight devices.

DIOS is engaged with a number of companies who are keen to develop the next generation of optical interrogators. Part of the competitive advantage is the development of systems with comparable high performance at a significantly reduced price which opens up a number of new potential markets such as automotive and medical.



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# Virtual Typography Limited

**Team Leader: Matthias Hillner, Royal College of Art and Dr Ruddy Vincent, Imperial College**

Virtual Typography Limited is a company that specialises in design solutions that increase health and security by impeding or restricting the supply of information. The company is directed by Matthias Hillner and Dr. Ruddy Vincent, who joined forces in 2009 to combine creativity and innovation with scientific analysis, knowledge and experience.



Matthias Hillner



Dr Ruddy Vincent

## What exactly is virtual typography?

Virtual Typography is a term to describe text information that is visually concealed in order to delay the recognition of texts or to make reading impossible. In other words virtual typography is that which is “virtually typographical”.

Depending on the circumstances a reduction of information can be beneficial. Having less information available and being able to focus on what matters can often enhance security. It is also useful in situations where an individual does not wish to share information with others, for example in the case of financial transactions.

SafeView is a new keypad that will enhance the security of PIN Entry Devices (PED) such as Automated Teller Machines (ATM), Chip and Pins Card readers (CPR) and Security Entry Systems (SES). SafeView keypads offer an unprecedented countermeasure to fraud-related shoulder surfing as they prevent any person or camera from detecting the keys pressed on the PIN pad. The technical details are currently treated as sensitive and they will be disclosed as soon as the patent is on file.

## The market

There are currently around one million Chip and PIN Card Readers and 64,000 ATMs in the UK. In Europe there are currently around 400,000 ATMs and over five and half million PIN Card Readers. Worldwide there are some two million ATMs and 40 million PIN Card Readers. The combined market value is £2.5 billion in Europe and £16 billion worldwide. The market of security access is currently under examination.

## Facts and figures

- In 2008 there was a 35% increase in UK retailer fraud and a 31% increase in cash machine fraud.
- In 2008 there was an overall loss of £144.2 million in the UK alone and a cumulative £1 billion since the introduction of Chip and Pin technology in 2004.
- 75% of people agree that Chip and PIN is more secure than a signature.
- 53% of people say they feel wary of letting their card out of sight when in a shop or restaurant.
- Many people (47%) first discover that they have been a victim of card fraud when they notice fraudulent transactions on their statements.

## Achievements

Virtual Typography Limited has been awarded for the “Most Innovative Idea” during the University of Hertfordshire flare business plan competition. It succeeded against a competition of 147 entries. The company is a member of the Security in Technology Consortium (SITC).

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