innovation insights

Issue 3 June 2016

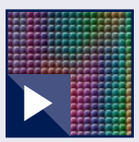
The latest innovations, collaborations and technology transfer

Evidence Based Medicine

Enabling clinicians to deliver the best care to patients

Building miniature atomic clocks

Remote spectroscopic sensing



Improved plasmonic filters

Real-time database linkage

OXFORD UNIVERSITY INNOVATION

UNIVERSITY OF OXFORD

subscribe

contents

innovation insights ▸

contents

information

investment

consultancy services

invention

Oxford University Innovation

Support for innovation in Oxford, already strong, is growing. The next step in this process is the rebranding of Isis Innovation as Oxford University Innovation, which – as you will see from the design of this publication – is now being rolled out.

This change follows the University's Innovation Strategy which recommended that we become more directly responsive to the University divisions. Steps such as an increased focus on hotdesks throughout the University for staff to be closer to research activities, and greater divisional representation on our board have already been implemented, and now we are delighted to have a new name that clearly describes what we do.

This edition of Innovation Insights features the work of the University's Centre for Evidence Based Medicine, including details of how our Consulting Services team can facilitate workshops and training opportunities with the Centre. Other articles feature technologies and consultancies from a broad range of disciplines.

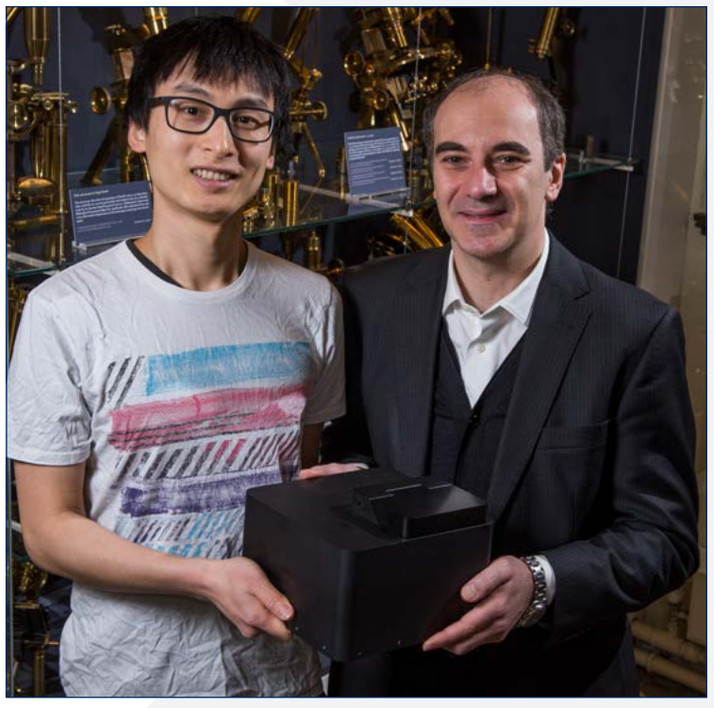
All of us at Oxford University Innovation look forward to continuing to provide excellent service to our University colleagues and external clients over the years ahead.

We hope that you enjoy reading this publication, and welcome your feedback.

Linda Naylor,
Managing Director

News

Oxford University Innovation record 4 new spinouts in May, Oxford Nanoimaging, OxStem, Vaccitech and EvOx Therapeutics, raising nearly £37m between them, increasing the total to 9 for the year.



Oxford spinout to provide desktop super-resolution microscopes

Oxford Nanoimaging begin production of their elegant desktop optical microscope

full article ▶

OxStem stem launches cell drugs to treat age-related disease

Oxford spinout, OxStem, has developed small molecule drugs for major age-related conditions

full article ▶

Universal flu vaccine under development by Oxford spinout

Vaccitech has developed a universal flu vaccine to improve the protection against the seasonal flu vaccination

full article ▶

EvOx Therapeutics raise £10m for precision system to treat disease

A precision technology to deliver drugs to specific parts of the body using exosomes

full article ▶

Collaboration on population-scale sequencing analysis

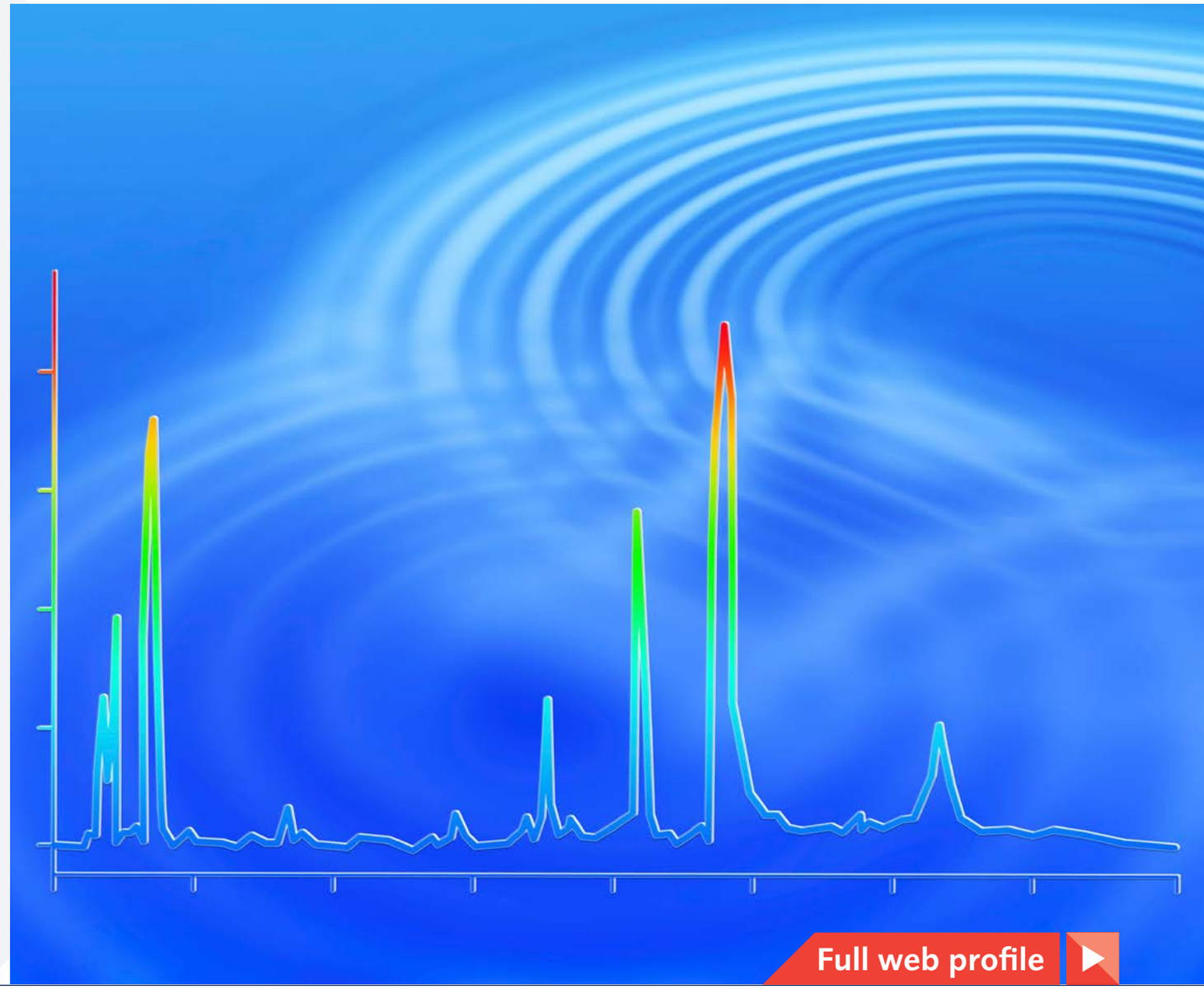
Genomics plc and DNAnexus collaborate to develop software solutions to uncover the relationships between genetic variation and human disease

full article ▶

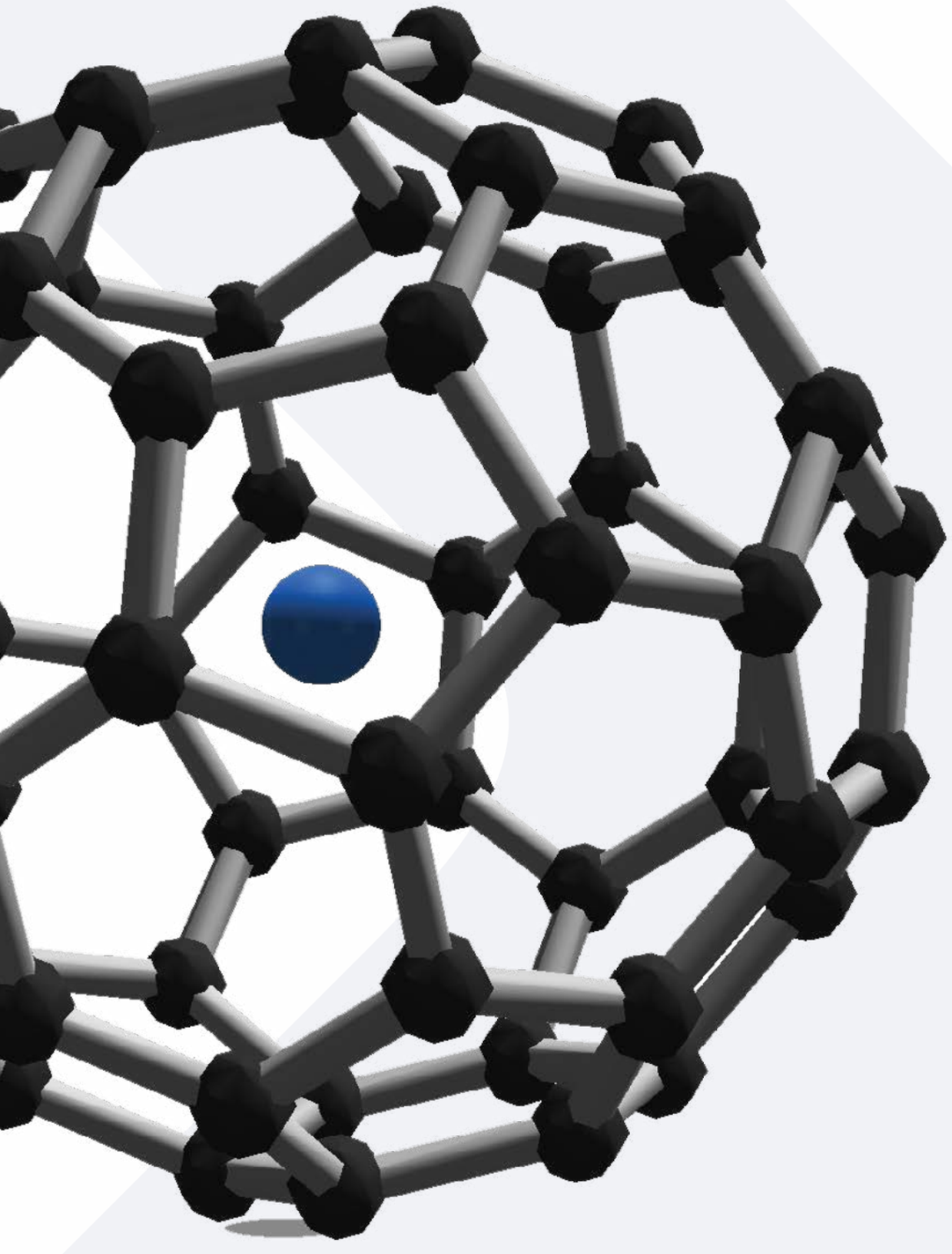
Liquid Chromatography

Liquid chromatography is an important process for the separation of a variety of analytes. A number of different forms of liquid chromatography are available. These include normal and reversed-phase high performance liquid chromatography (HPLC), size-exclusion, and ion-exchange chromatographies. Liquid chromatography is often coupled with mass-spectrometry (MS) as this allows mass-analysis of the separated analytes.

Research at Oxford has led to the development of a new chromatographic technique which improves resolution for polar analytes, whilst maintaining MS sensitivity by adding an ion-pairing reagent into the mobile phase. This Ion-Pair Hydrophilic Interaction Liquid Chromatography (IP-HILIC) approach reduces the retention of polar analytes and has the added benefit of providing simpler MS spectra, with fewer charge states, when compared with HPLC only.



Full web profile



Building miniature atomic clocks

Consulting Services have recently arranged consultancy for Dr Edward Laird, Research Fellow in the Department of Materials, with ResoCator, a company developing Miniature Atomic Clock (MAC) chips. Atomic clocks are the most accurate timekeepers known. Current models exist which won't gain or lose a second in billions of years but the focus of this consultancy is to advise ResoCators chip designers in building stable atomic clock devices as small as 1mm².

Dr Laird is part of the research group in Oxford which first developed this MAC technology based on nitrogen isotopes encaged in Buckyballs. Through this consultancy, Dr Laird is providing expertise around the physics of MACs to support Resocator in bringing the innovation to market. The MAC will be integrated into a variety of chip designs small enough to be incorporated into virtually any device, and marketed as Global Resource Locator (GRL) enabled devices, the next generation of GPS with indoor and outside location capabilities.

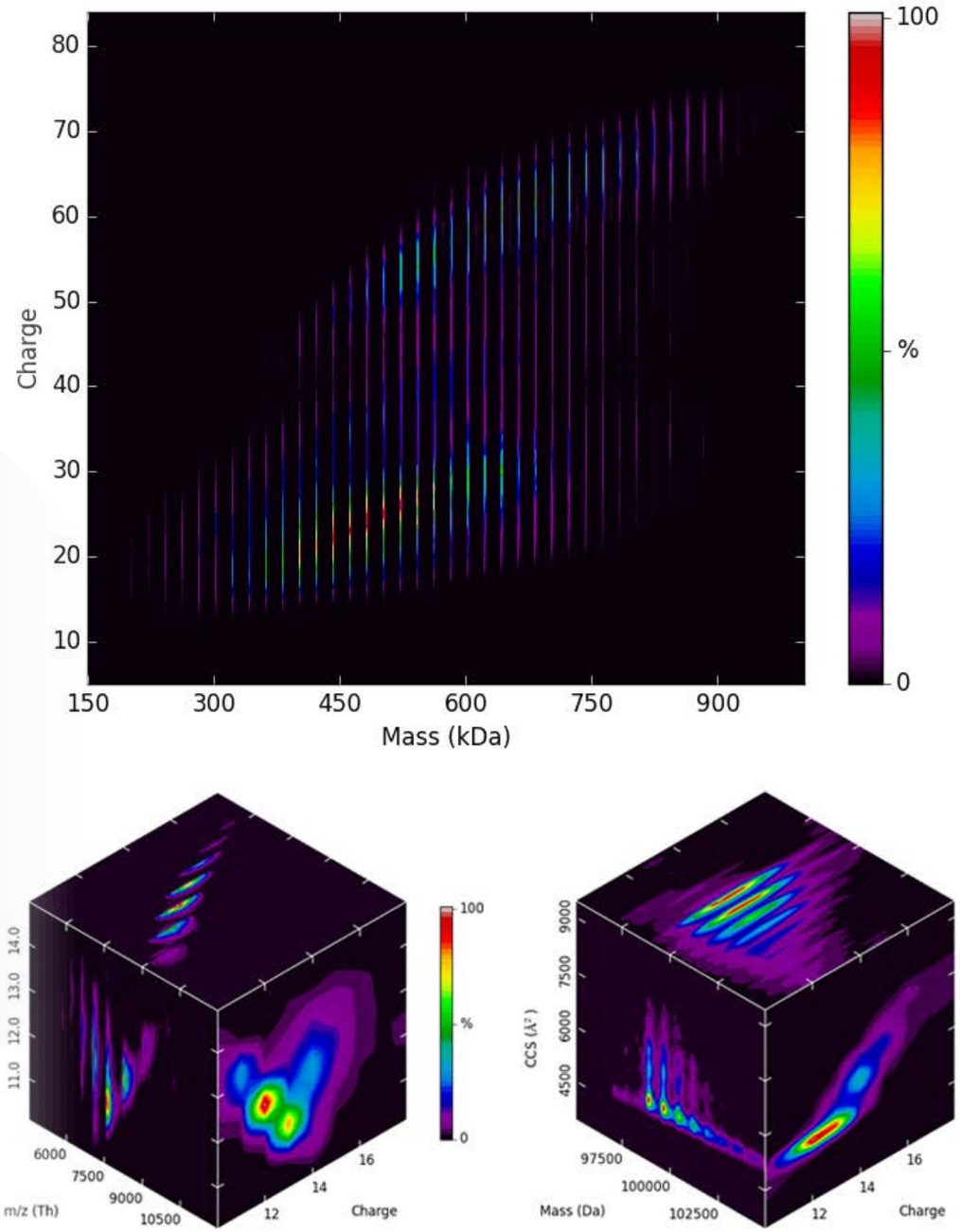
Visit Site

Interpreting mass spectra data

University of Oxford researchers have created a new universal approach for the analysis of mass spectra data.

Their Universal Deconvolution software deconvolutes spectra in a rapid, robust, and flexible manner by employing a Bayesian framework to separate the mass and charge dimensions.

UniDec requires minimal user intervention and allows for fast analysis of complex or polydisperse spectra. This proprietory software overcomes the limitations of existing methods, for example, peak assignment and fitting. UniDec greatly facilitates the analysis of ion mobility and mass spectra.



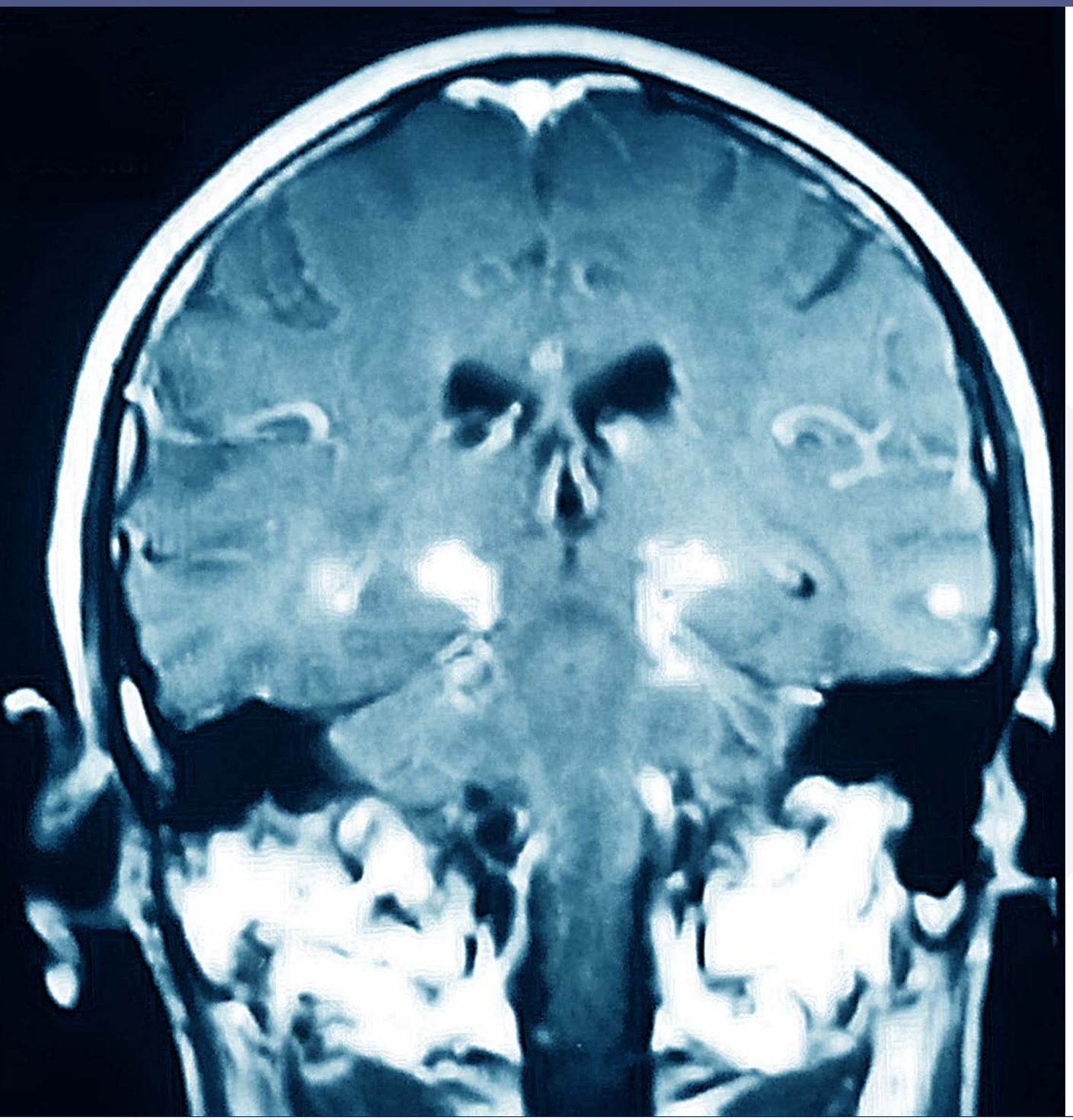
Full web profile

Cloud-based consumer market research

Flying Fish Research (FFR), a new venture from the Startup Incubator, is the fastest cloud-based research lab out there. Using the latest multisensory cognitive and affective neuroscience, we provide evidence-based insights for design, product, and service innovation.

FFR provides online testing solutions for companies (i.e., consumer goods, food and beverage, marketing communications), both big and small, as well as for scientists (as part of our outreach programme). Over the last two decades we have published more than 700 peer-reviewed scientific articles, demonstrating that our expertise is second to none. FFR aims to automate online research and to be able to conduct studies for anyone who has an internet connection.

Visit Site



Biomarkers for Parkinson's Disease (PD)

Parkinson's Disease (PD), which causes significant disability and reduction in quality of life, is the second most common neurodegenerative disorder in the world.

Early diagnosis in an individual can be extremely beneficial in terms of identifying potential therapies. However, early identification of PD can be very challenging as the signs and symptoms of the disease tend to overlap with other conditions.

Researchers at Oxford University have identified proteins that are differentially expressed in PD patients relative to individuals without PD. The proteins may be used as markers for the diagnosis or monitoring of PD.

Full web profile

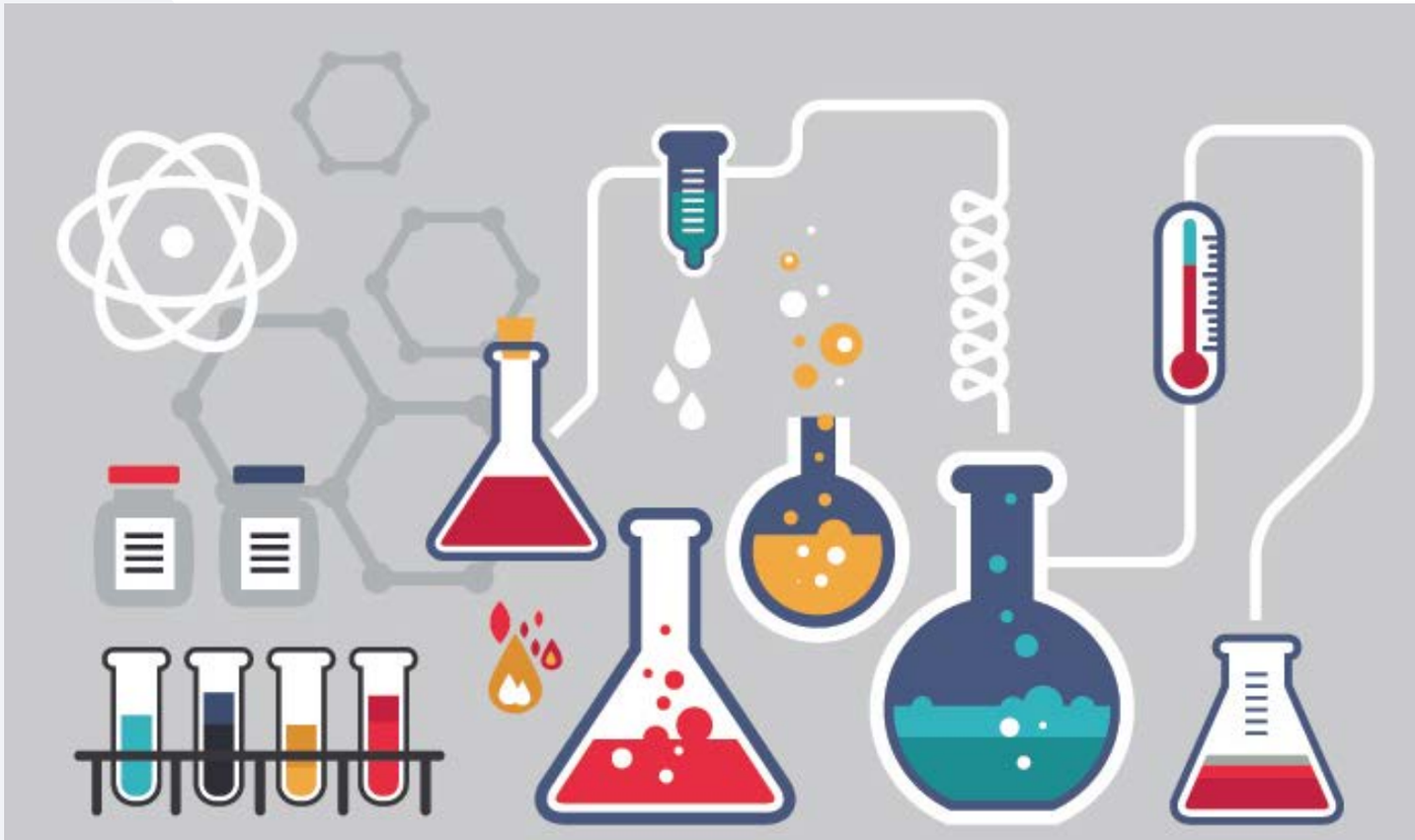
Easy steps to protect your intellectual property

In the rush to drive forward the development of your business, it is strategically important to plan and protect your IP.

Intellectual property rights are very often central to the development, growth, and even the survival of a new business in a competitive market place.

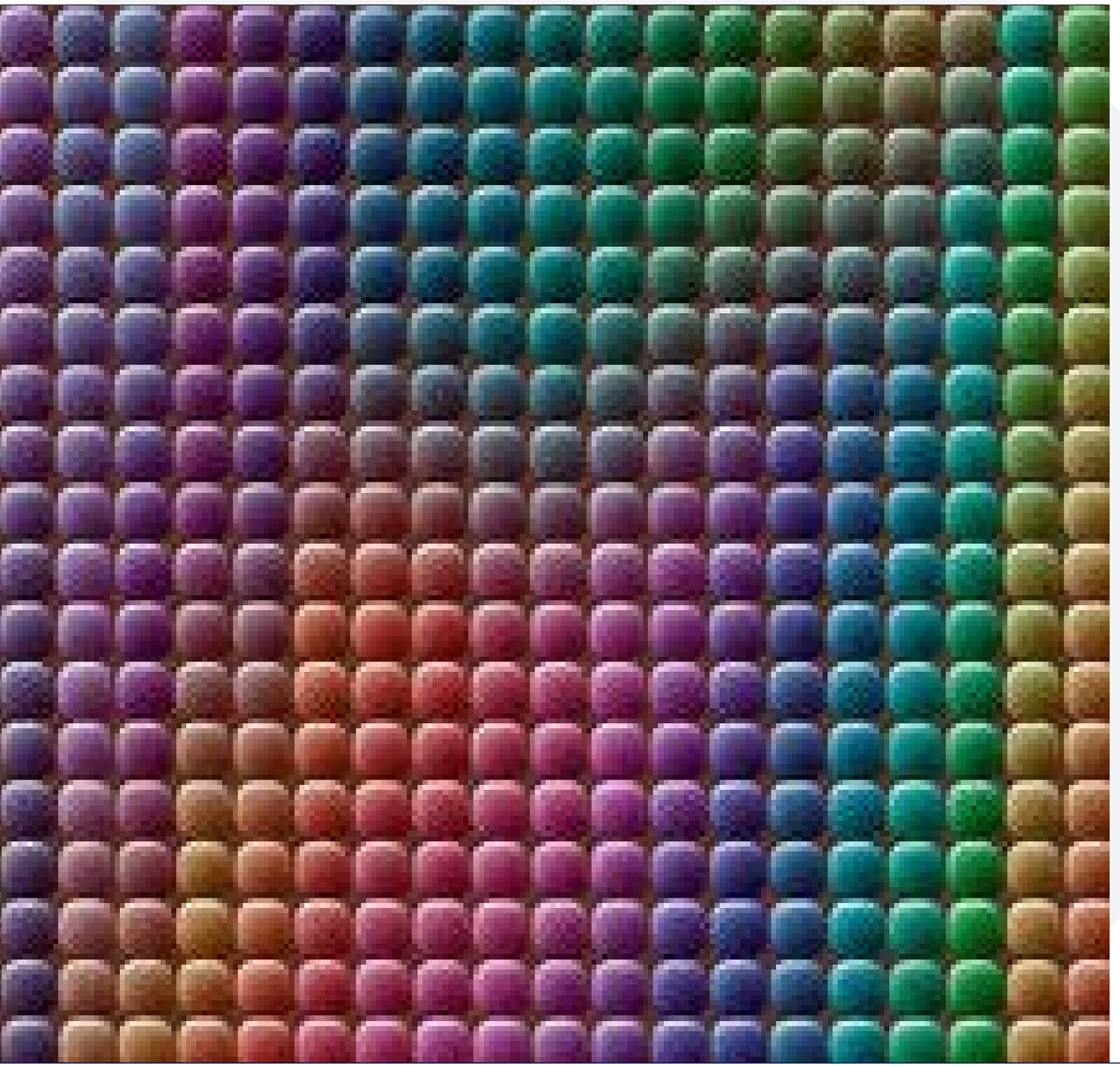
Businesses seeking investment, particularly startups, will find their intellectual property subject to scrutiny and the investment decision may hang on the IP it owns or has rights to use under any technology transfer agreement. Competitors may look to exploit and profit from gaps in a rival's IP protection.

Taking steps to protect and enhance its IP should form a key part of any business's strategic objectives. Some easy steps to help implement an effective IP protection strategy are considered in our article.



Full web article

Improved plasmonic filters



Digital cameras contain colour filters which are placed in front of the image sensor to capture the red, green and blue, or cyan, magenta and yellow light components of a scene. The limits on the size, alignment and manufacturability of the polymer-based colour filter arrays limit the performance of the image sensors. As image sensors continue to improve, the constraints arising from the filter itself become more significant.

The digital industry is seeking to overcome these constraints and the most promising technology is the plasmonic filter which offers high tunability. The possibility of higher selectivity together with ease of manufacture through compatibility with the CMOS production processes used to make today's image sensors.

Oxford researchers have developed a novel plasmonic filter arrangement. Proof-of-concept nanostructures have been fabricated which already demonstrate class-leading performance ahead of future work on design and process optimisation.

Full web profile

Historical experiences

Consulting Services has arranged a consultancy framework agreement to formalise cooperation between the National Trust's Ham House and three DPhil students from Oxford. Ham House is a wonderful 17th century stately home with a historic collection of textiles, furniture, and paintings dating back over 400 years.

Following initial workshops with the National Trust, each member of the student team decided to focus on a specific historical object as a starting point to explore historical context. From the History Faculty, Emma Turnball is exploring Catherine Murray's portrait miniature, focussing on Caroline court fashions and Civil War politics, while Rachel Delman will investigate the garden bench from the 1670s and the wider context of the garden's development, the relationship between Ham and European court culture, and Ham's status as an Italianate villa – semi-urban and semi-rural. Emily Knight, from the History of Art, will concentrate on a posthumous portrait of Maria Caroline, considering mourning in the long eighteenth century and portraits as objects of memory. The students are looking forward to the challenges they will encounter on this collaboration, which could feed useful experience into their studies at the same time as giving Ham House valuable insights for their exhibits.

Visit Site

Real-time database linkage

Methods to link records in one or more databases are in demand for a range of applications. In real-life situations this could be problematic, owing to incomplete or inaccurate datasets.

Erroneous linking or separation of records can lead to reporting and meta-analyses inaccuracies. Current methods used to overcome such issues suffer from a number of disadvantages that include processing speed, accuracy, and the ability to scale to larger numbers of records.

Oxford researchers have developed a high-performance record linkage algorithm that offers fast, reliable, and flexible real-time data linkage. The method also allows the examination of new data as it is entered to provide an early warning about data entry errors.

Full web profile

The Panel
(From left to right):
Lionel Taressenko,
Constantin Coussios,
Chris Reichhelm, Stephen Tetlow
and Steve Cleverley.

Entrepreneurship in Engineering

Support for Entrepreneurship in Engineering and experiences from serial entrepreneurs.

Entrepreneurship in Engineering was put in focus at the March 17th, 2016 meeting of the Oxford Innovation Society. The event featured Professors Lionel Taressenko and Constantin Coussios who are both serial entrepreneurs. They joined a panel that comprised the sponsors of the event, Chris Reichhelm (Peloton Advisors), Stephen Tetlow (Chief Executive of the Institution of Mechanical Engineers) and Steve Cleverley (Head of Isis Enterprise). IE is working with the Royal Academy of Engineering to provide training in entrepreneurship. The panel addressed issues like the importance of skills training in entrepreneurship, internship programmes in spinouts, and inspiring engineers of the future. The event was held at Lady Margaret Hall.

Visit Site

Driver-centric estimation of vehicle range

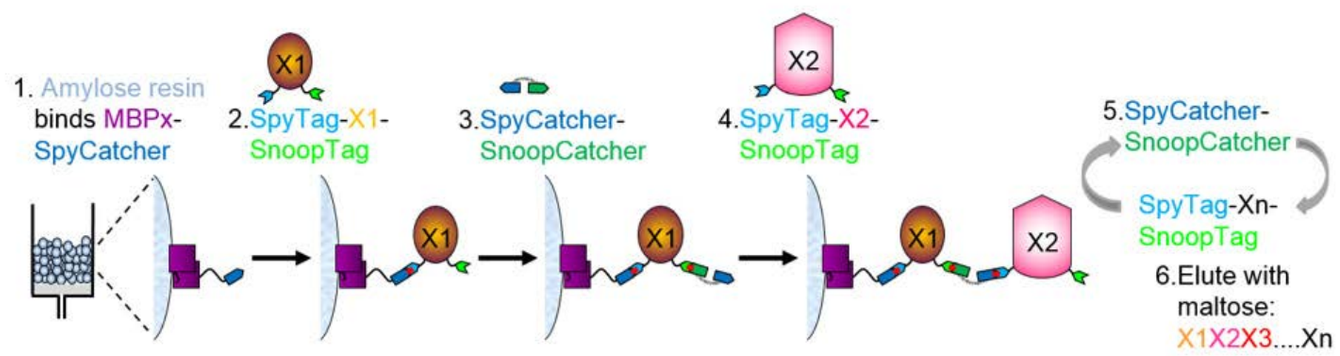
A range estimation method for electric vehicles has been developed by The Oxford Mobile Robotics Group to measure the driver's ability to reach a particular destination, given the current state of the battery in the vehicle.

All reachable destinations are updated in real-time and displayed to the user in the form of a map, minimizing range anxiety. The method requires no user interaction and self improves over time by adapting to the specific user and his or her driving style.

Full web profile

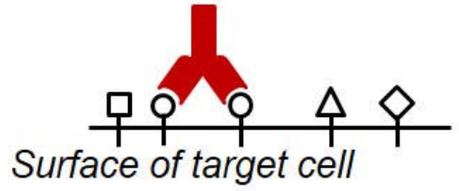
Protein team assembly for controlling cell signalling and catalysis

SnoopTag/Snoop Catcher is a genetically-encoded peptide/protein pair that reacts to form an irreversible isopeptide bond simply upon mixing.



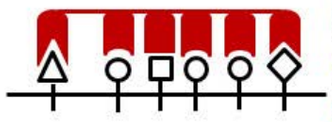
This reaction makes it possible to link proteins into chains on a solid phase in a highly specific and efficient manner. The method is simple to carry out, modular, and produces irreversibly linked and molecularly-defined protein chains. Proteins often work in teams and so this method creates the opportunity to either control or artificially generate such multi-component systems. Applications include regulating immune responses and cell differentiation, or generation of antibody polymers for sensitive diagnostics, multi-enzyme assemblies to enhance metabolic flux, and strong modular biomaterials.

Typical cell surface ligands



Usually single input.

Polyprotein ligands



New class of molecule enabled by SpyTag and 2nd glue SnoopTag

Multiple inputs in precise arrangement. Maximize signal activation, minimize non-specific effects.

Full web profile

subscribe

Smart control of electrochemical energy storage

Batteries are ubiquitous. From the smallest "button" batteries to the familiar 'AAA' and 'AA' batteries to the larger batteries in our mobile phone, laptop and car, we are all familiar with the value of using chemistry to store electrical energy.

Increasingly, these off-grid uses are being joined by grid-connected applications where batteries are used to support the integration of green energy technologies within the grid. Yet despite the familiarity and usefulness of batteries there remain some limitations e.g. different types of battery cannot easily be mixed; a battery pack can fail when the state of health of only a single cell deteriorates.

Oxford researchers have created improved systems for managing cells within packs allowing different cell chemistries (extending even to mixtures of batteries and super-capacitors) and states of health to be mixed offering improved performance and flexibility. In addition to simulation and lab-based testing, "looks like, works like" prototypes are being produced for field trials of these ideas.

Full web profile

Fostering Innovation in Argentina

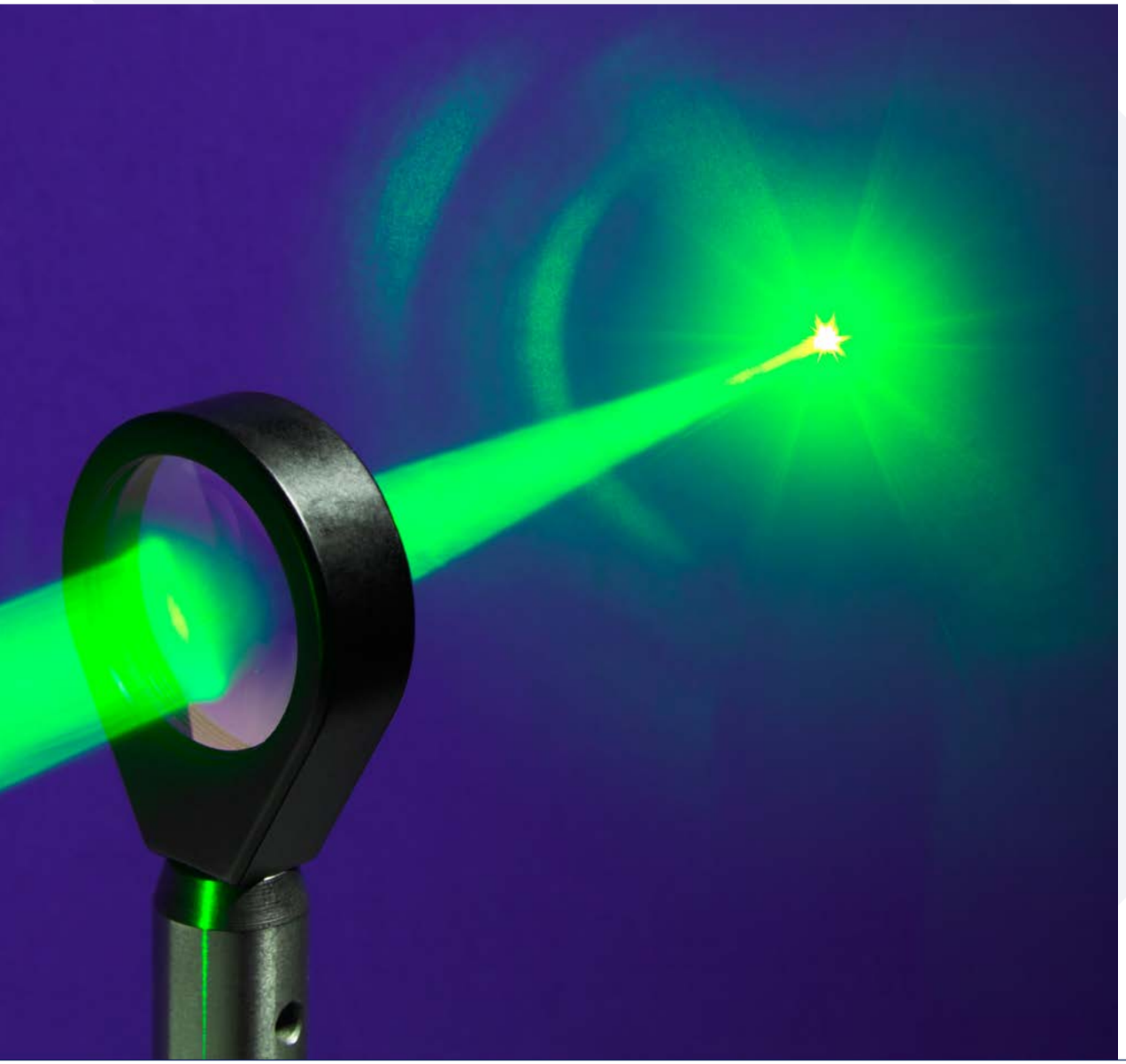
Isis Enterprise (IE) has continued its dedicated work to foster innovation in Argentina. In 2016 IE embarked on two new projects; one with the National Scientific and Technical Research Council (CONICET), and the second with the National University of Litoral (UNL).

In April, Isis Enterprise delivered a seminar in Santa Fe (Argentina) organised by UNL and targeting neighbouring regional governments and local universities. The seminar looked at how universities can partner with institutions such as local governments, banks, and science parks to foster innovation and entrepreneurship in their regions, and at the elements needed for a healthy innovation ecosystem.

IE is also helping to strengthen the capabilities of staff at the Argentinian National Scientific and Technical Research Council. The project will culminate in a visit to Oxford in July this year for five members of staff who will receive support from IE in commercialising specific technology based projects.

Visit Site

Remote spectroscopic sensing



Oxford researchers have developed a measurement technique that overcomes the speed limitations of traditional optical instruments and enables fast, continuous, single-shot measurements in optical sensing, spectroscopy, and imaging.

This invention maps the spectrum of an optical pulse to a temporal waveform whose intensity mimics the spectrum, thus allowing a single-pixel photodetector to capture the spectrum at a scan rate significantly greater than what is possible with conventional space-domain spectrometers. The technique has previously been established using a dispersive medium such as fibre optic cable.

This technique removes the need for the fibre optic dispersive medium, operating in free-space, resulting in a tuneable device, operating across all optical wavelengths, with potentially higher sensitivity than previous devices. The invention may provide significant improvements in sensitivity, particularly at wavelengths that are absorbed by fibre optic cable. This invention could result in an improvement of a variety of scientific, industrial and biomedical applications in the form of spectroscopy, imaging, laser scanning and analogue-to-digital technology.

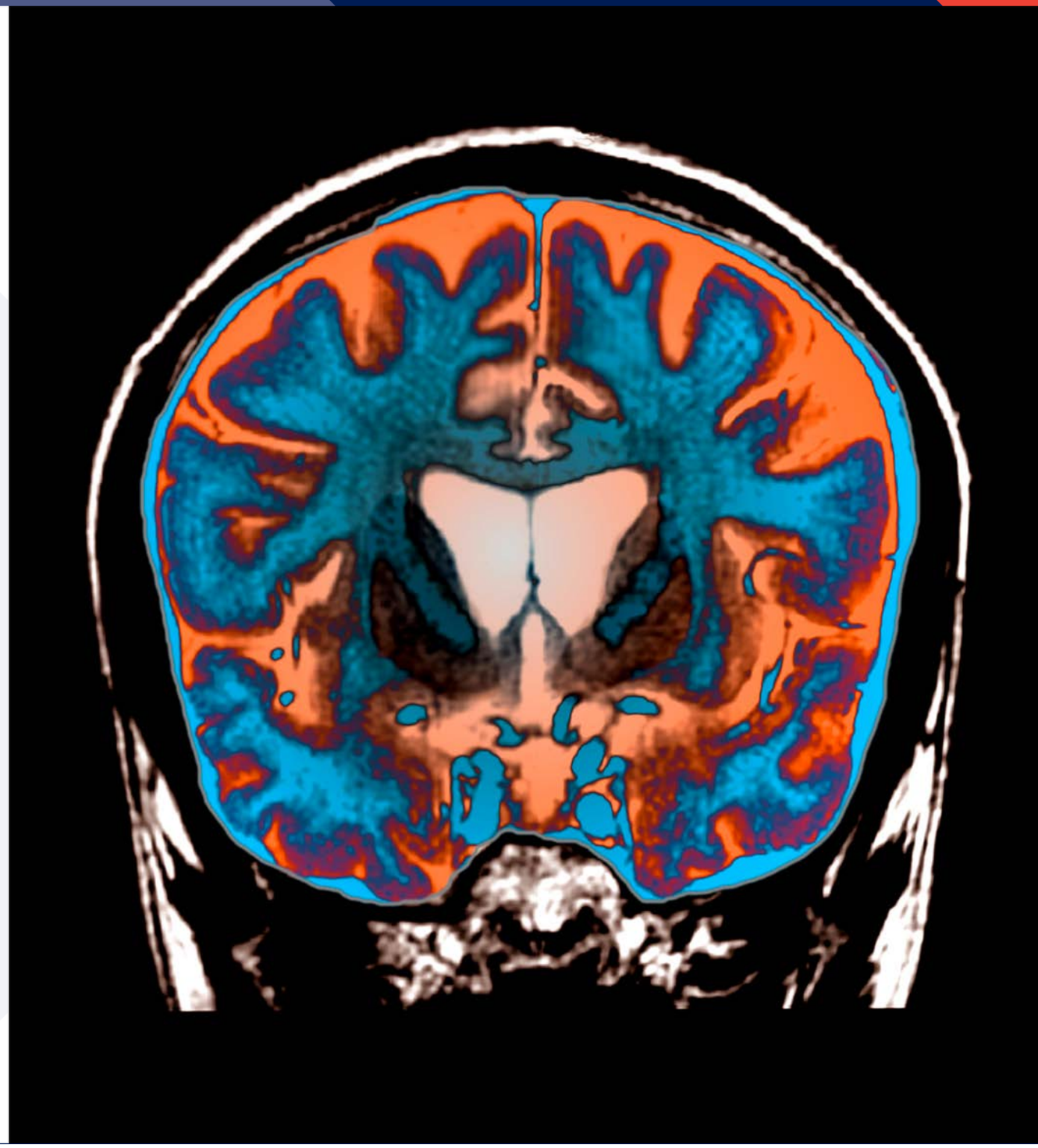
Full web profile

Combination therapy to slow brain atrophy

With ever improving healthcare, life expectancy is increasing and as a result age-related complications are becoming more common.

Age-related cognitive decline is becoming increasingly common, with Mild Cognitive Impairment (MCI) affecting around 16% of those over 70 years old. Researchers at the University of Oxford have found strong evidence that increased omega-3 fatty acid intake together with vitamin B supplements can markedly slow brain shrinkage (atrophy) and cognitive decline.

This project is an opportunity to develop a combination therapy to treat age-related cognitive decline such as MCI.



Full web profile ▸

Gene sequencing for bacterial isolates

Researchers at the University of Oxford have identified short regions of DNA, also known as Kmers, within protein-encoding ribosomal genes that are highly species specific.

The sequences have been shown to be very rarely found in the genomes of any other bacterial species, whilst they have high coverage to ensure reliable identification. The researchers have developed libraries of single species Kmers that can be used for computational identification of bacteria species from electronic DNA records or from experimental detection of these DNA regions within a biological sample.

Full web profile

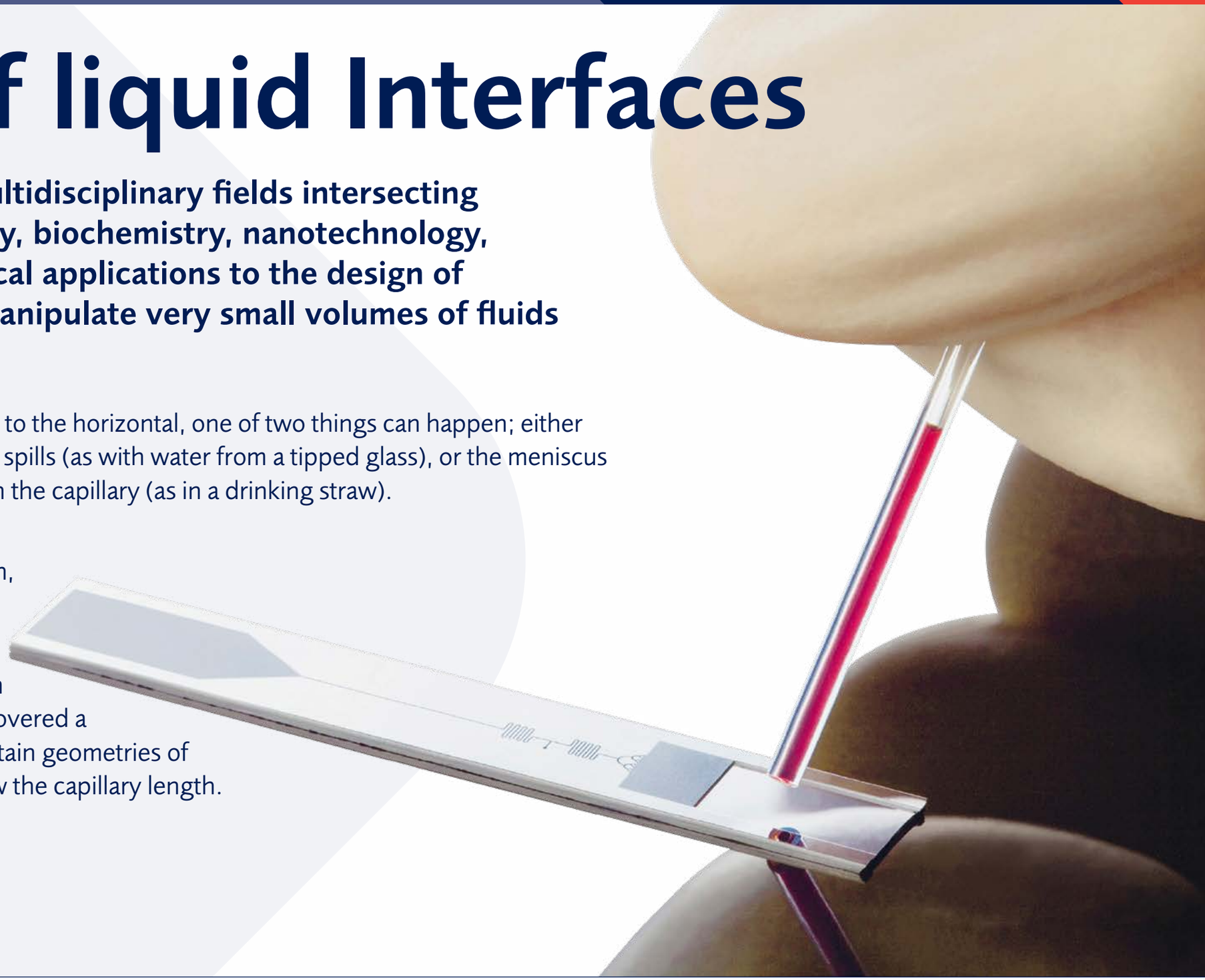
Control of liquid Interfaces

Micro and nano fluidics are multidisciplinary fields intersecting engineering, physics, chemistry, biochemistry, nanotechnology, and biotechnology with practical applications to the design of systems used to control and manipulate very small volumes of fluids contained within them.

When a capillary filled with liquid is turned to the horizontal, one of two things can happen; either the meniscus becomes unstable and liquid spills (as with water from a tipped glass), or the meniscus maintains and the liquid remains trapped in the capillary (as in a drinking straw).

Traditionally, if the capillary width is substantially larger than the capillary length, the liquid spills, while if it much less than the capillary length, it remains trapped.

A multidisciplinary team of academics from across Europe and led by Oxford, has discovered a method to destabilise the meniscus for certain geometries of fluidic systems, at length scales even below the capillary length.



Full web profile

Using evidence to improve patient care

There are many reasons why medical literature can, on occasions, be misleading or perhaps even incorrect and so it is essential for a clinician to be able to distinguish "good" evidence from "bad". Evidence Based Medicine (EBM) enables clinicians to critically appraise the available evidence and apply it to support the delivery of the best clinical care to patients.

continued ▶

consultancy services

The Centre for Evidence-Based Medicine (CEBM) has for over 20 years produced high quality research, capable of improving clinical practice. To achieve this, CEBM use a variety of methods including carrying out clinical trials, conducting systematic reviews, qualitative work, theoretical modelling, database analysis, and quantitative analysis. CEBM is dedicated to the practice, teaching, and dissemination of high quality evidence-based medicine, and is a global leader in applied healthcare research and evaluation.

CEBM devote a large proportion of their time to capacity building work through outreach teaching and training activities - making EBM accessible to a wide range of healthcare professionals, working with national and international organisations.

CEBM have delivered training to develop national guidance, facilitate research, and implement and evaluate interventions for a variety of healthcare settings. Added to this is world leading training in all aspects of Evidence-Based Healthcare and the development of a significant cohort of EBM teachers.

Consulting Services works closely with CEBM, to deliver bespoke high quality, problem-oriented, learner focussed workshops in the field of EBM such as:

- **An introduction to Evidence-Based Medicine**

  This course introduces the basic concepts and skills of EBM including how to formulate an answerable question, track down the best evidence, do rapid critical appraisal of controlled trials, and apply the evidence to patient care.

- **Developing Evidence-Based Guidelines**

  Recognising the way in which healthcare organisations such as the WHO and the National Institute for Health and Care Excellence (NICE) produce clinical guidelines, this course provides organisations with step by step training in the process of developing their own guidelines.

- **Knowledge into Action**

  This course aids the understanding of how to use research evidence to make bench to bedside decisions, improve clinical care, and inform policy.

continued ▶

- **Communicating risk and shared decision making**

  This course explores the mechanisms by which clinicians can communicate risk to patients, either directly or indirectly, and the role that EBM has in informing shared decision making.

- **Teaching Evidence-Based Medicine**

  This course teaches delegates to disseminate their understanding of EBM to others through various teaching methods and is suitable for organisations who have made a commitment to embed the principles of EBM in their strategy.

- **Evaluating Healthcare Interventions**

  Quality improvement projects require a robust approach to evaluation, combining qualitative and quantitative methods. This course is suitable for organisations who are considering implementing evidence in their own health care setting

- **Research Methods and Systematic reviews**

  A systematic review identifies and pools all available research in a specific clinical area, collating the results in a statistically valid fashion to assist in the assessment of the benefits of a potential treatment or product. Unfortunately, done poorly, a systematic review can give deceptive results. This course will train clinicians to become skilled practitioners in the art of systematic review and other research methods.

  For more information and to discuss bespoke courses please contact Kerry Antcliffe on **kerry.antcliffe@innovation.ox.ac.uk**.

Visit Site

Oxford Innovation Society 2016/17

The Oxford Innovation Society (OIS) is an open innovation network for industry, academia, and investors. This year's meetings will be held on:

- Wednesday 6 July
- Thursday 15 September
- Thursday 23 March

Meetings are held in Oxford for OIS members and invited guests, and are followed by a formal reception and dinner. Details on www.innovation.ox.ac.uk/ois

Oxford University Innovation Ltd
Buxton Court
3 West Way
Oxford
OX2 0JB

T +44 (0)1865 280830
E enquires@innovation.ox.ac.uk
W innovation.ox.ac.uk

@OxUInnovation

linkedin.com/company/oxford-university-innovation

Designed and produced by www.imageworks.co.uk