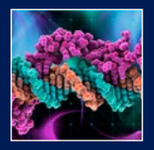
INNOVATION insights

THE LATEST INNOVATIONS, COLLABORATIONS AND TECHNOLOGY TRANSFER FROM THE UNIVERSITY OF OXFORD

ISSUE 8 FEBRUARY 2018

#STARTED IN OXFORD

A showcase event for startups, spinouts and social enterprises ▶



Oxford Protein Analysis Software Suite ▶

Sparse decomposition of arrays ▶

Improving cross-linking models between amino acids ▶

A stimulating solution ▶

OXFORD UNIVERSITY INNOVATION

UNIVERSITY OF OXFORD

SUBSCRIBE ▶ | CONTENTS ▶

INNOVATION insights

CONTENTS

A world-leading innovation ecosystem with Oxford University at its heart

As a result of substantial effort by our staff and Board of Directors I'm pleased to be able to share our revised vision and mission with you. The vision, above, expresses what we aspire to. We're already making good progress as you will see from our Annual Report. The starting point of the path that leads to our vision is summarised for each of us working at OUI in our mission, "As architects of creative solutions, we enable the University community to maximise the global impact of Oxford's research and expertise."

The Annual Report really does cover 12 months this year (after an enforced 16 month edition in 2016), and demonstrates again the vibrancy of the Oxford cluster. Oxford University has now launched 150 spinout companies, and in the past year alone OUI has added a further 25 companies to the ecosystem. With £1.5bn raised by Oxford spinouts collectively since 2011 we've started talking about the 'Oxford boom' with some justification.

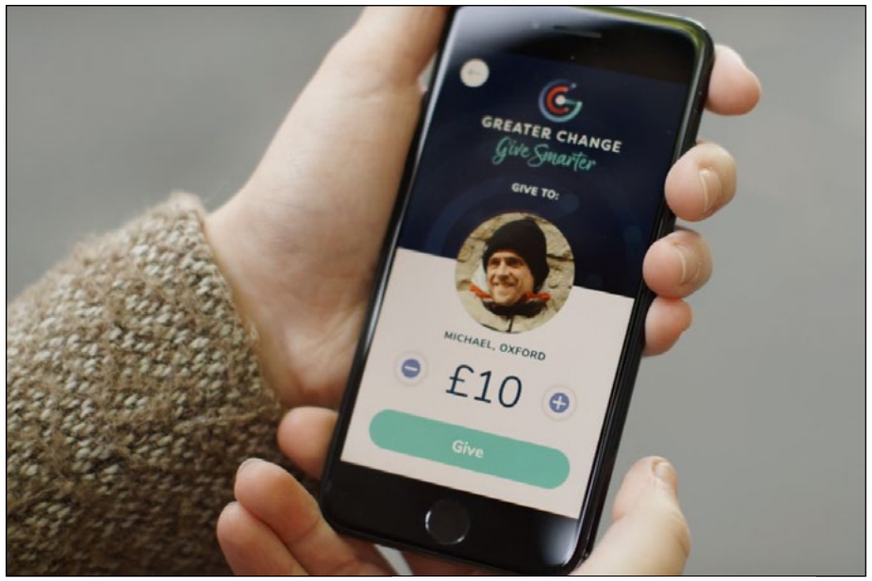
In my first year at OUI, the focus has been on renewing the vision, strategy and goals of the company, whilst strengthening engagements with our stakeholders. Please do read the OUI Annual Report, and subscribe to our website for notification of future issues.

I hope that #StartedinOxford is a term that you recognise – we've been using it as a hashtag on social media to demonstrate the breadth of entrepreneurial activity in Oxford for several years. At the end of last year our University colleagues used it to theme a number of entrepreneur events, including a hugely successful #StartedinOxford Demo Night, which they write about here. We are delighted to work with them, and others, to strengthen our world-leading innovation ecosystem. We hope that you enjoy reading news of the latest innovations from Oxford in this edition of Innovation Insights.

Matt Perkins, CEO

OUI ANNUAL REPORT 2017 ▶

News



Oxford graduate develops homeless donations app
Greater Change crowdfunding campaign has developed a mobile phone app that enables cashless giving to support the homeless.

FULL ARTICLE ▶

University of Oxford Innovation Fund IV, closing soon
Investors have the opportunity to invest in early stage spinout and startup companies emerging from the University.

FULL ARTICLE ▶

Oxford Universities 150th spinout company
Augmented and virtual reality company, 6Degrees, became Oxford Universities 150th spinout.

FULL ARTICLE ▶

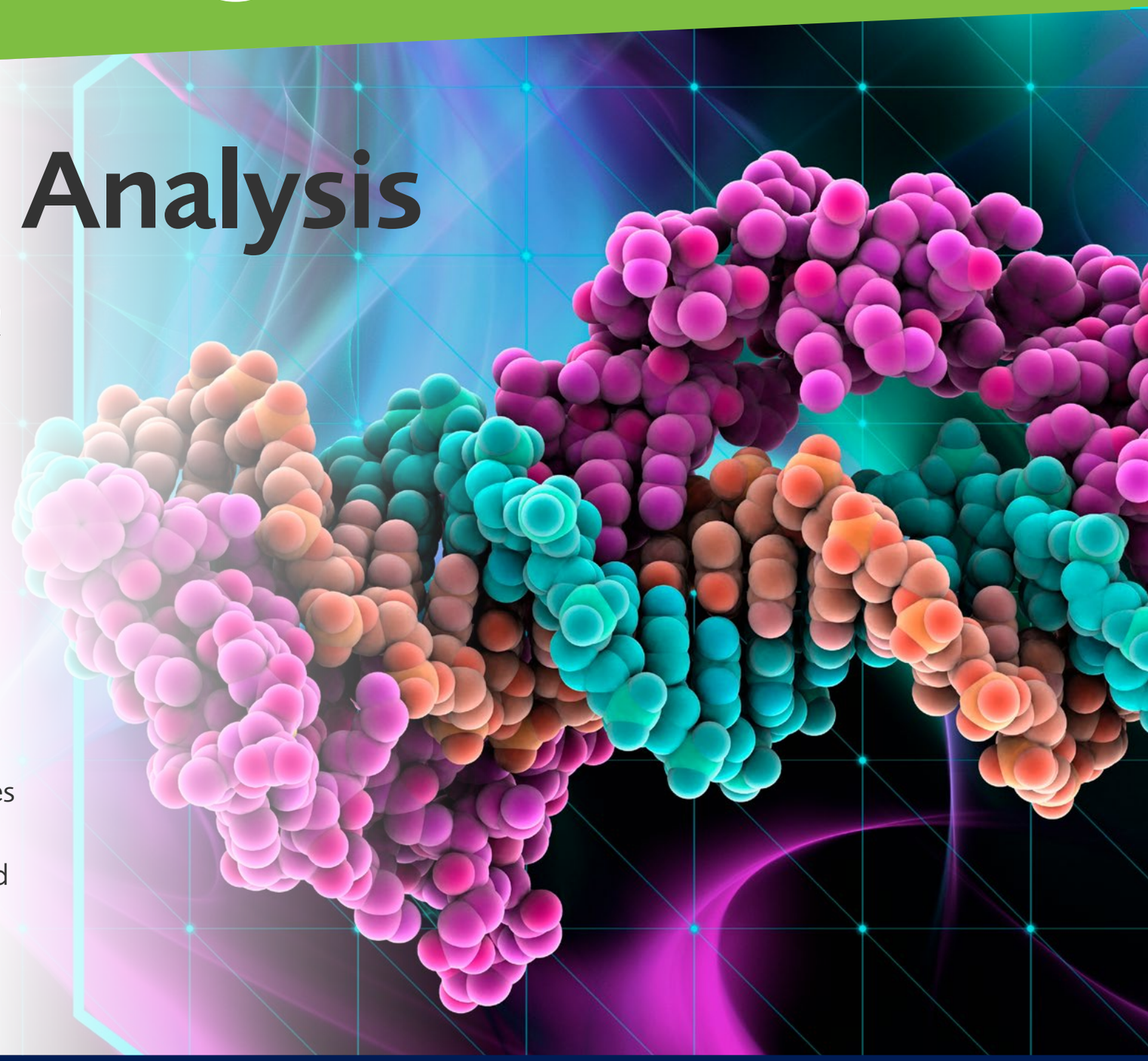
LAB282 celebrates a year of impact in Oxford
The £13m drug discovery partnership between Oxford University, Oxford Sciences Innovation and Evotec, LAB282, is celebrating its first year of operation after successfully accelerating 12 new projects.

FULL ARTICLE ▶

Vaccitech secures £20m Series A funding
Oxford University spinout Vaccitech will use investment from GV, Oxford Sciences Innovation and Sequoia China to advance a universal flu vaccine.

FULL ARTICLE ▶

Oxford Protein Analysis Software Suite



The process of characterising complex biomolecules, such as proteins, requires the use of a range of different techniques. Versatile software solutions are needed to bring together the information gathered from different sources and extract the most relevant parameters.

The Oxford Protein Analysis Software Suite (OxPASS) provides the means to collate data from Mass Spectrometry, NMR and X-Ray crystallography experiments with unprecedented speed and accuracy.

FULL WEB PROFILE ▶

Discovering a new reality

'Innovation impact through virtual reality' was the theme for the September Oxford Innovation Society (OIS) meeting held at Worcester College, Oxford. Oxford University Innovation (OUI) hosted a lively evening of talks and interactive workshops exploring the possibilities of augmented and virtual reality (VR).

Dr Brendan Ludden, Head of Technology Transfer, OUI lead the talks with his views on how VR has impacted various divisions within Oxford University. Dr Chris Paton, Group Head of Global Health Informatics Group, Oxford University and Professor Mike English, Senior Research Fellow at KEMRI Wellcome Trust, Oxford University shared updates on the scenario-based VR gaming platform, LIFE. David Whelan, Chief Executive Officer, Immersive VR Education offered a thought-provoking talk on how VR can improve how educational content is delivered.

A series of unpanel discussions followed the talks, offering guests the opportunity to network with senior researchers and industry experts.

FURTHER INFORMATION ABOUT THE OIS ▶

Miniature high temperature pressure probe

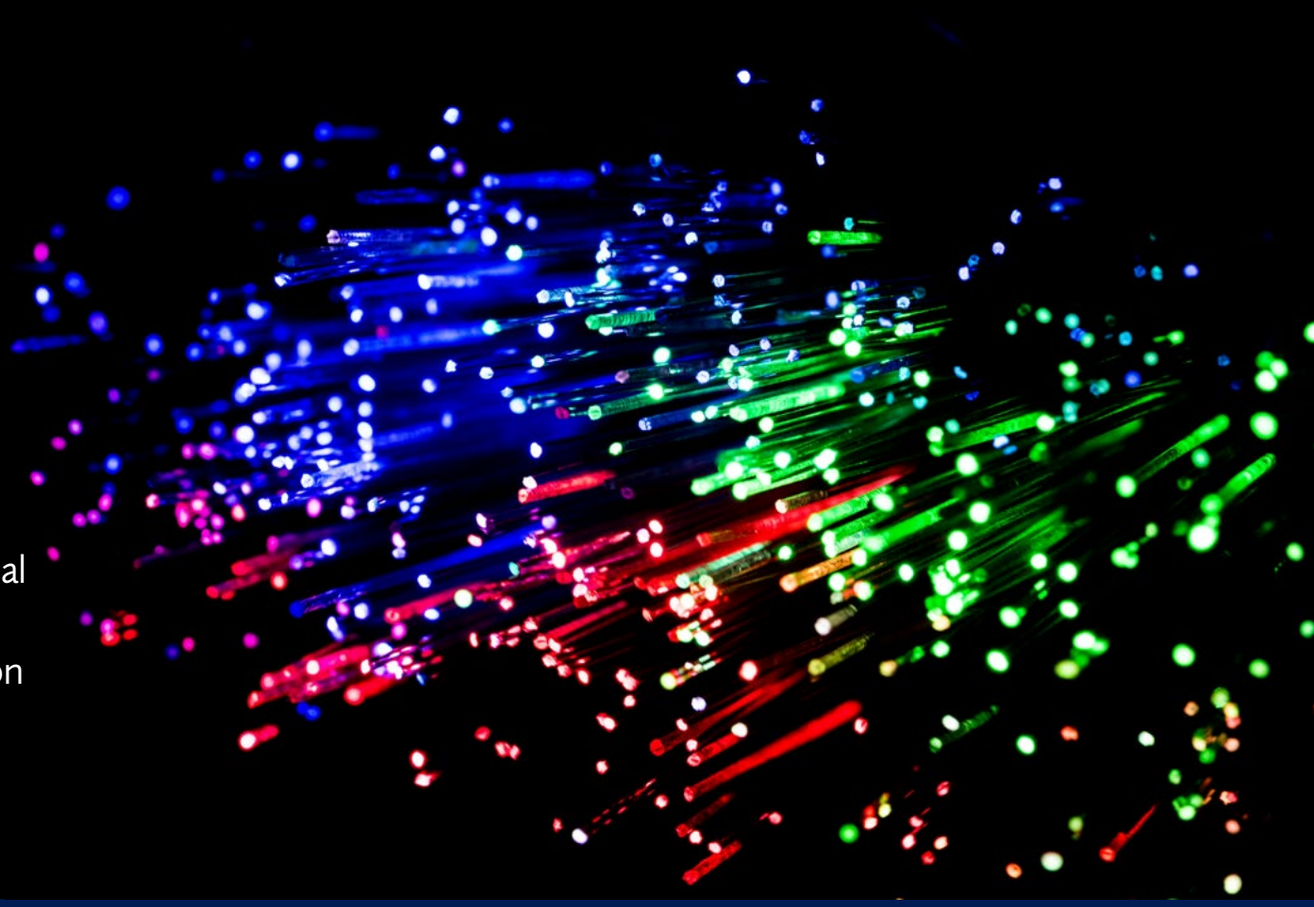
A common challenge facing the turbomachinery industry is the ability to measure time varying pressures in high temperature environments. There is an unmet need for a compact probe that can withstand extreme and varying conditions whilst reliably measuring unsteady pressures.

Academics at the Oxford University's Thermo-Fluids laboratory have developed a novel method of constructing a high frequency ultra-miniature total pressure probe that can be used in high temperature environments such as gas turbines or engine exhaust systems. The probe uses a particular construction which makes it robust and usable in turbomachinery, and allows it to survive without cooling at temperatures around 500°C - a major improvement on current methods without cooling.

FULL WEB PROFILE ▶

A new beam splitter for universal multiport interferometers

Programmable photonic circuits that can implement linear transformation between any number of input and output optical channels are used both for quantum computation in quantum optics and for signal processing in telecommunications. These "universal multiport interferometers" can be built using meshes of reconfigurable beam splitters, for example on an integrated photonic platform.



Oxford academics have developed a new method for implementing universal multiport interferometers, which uses a more compact mesh of beam splitters. The new design will be used to improve both quantum computation and signal processing capabilities.

FULL WEB PROFILE ▶

Xinchuang Tech

Oxford Innovation Society member, Xinchuang Tech, is the wholly owned subsidiary of NYSE-listed Xinyuan Group (NYSE: XIN), featuring the only business platform for technopolis of Xinyuan Group. Xinchuang Tech has proudly been the long-term practitioner of new pattern urbanisation construction, the powerful promoter of smart integration of technologies and cities, and the leading comprehensive operator of technopolis in China.

Xinchuang Tech is committed to "promote the upgrading of urban industries as well as economic development through innovation and technologies, ultimately improving people's livelihoods". The company adheres to the idea of 'technologies for cities development', which in turn promotes technological progress and smart integration of technologies and cities.

The business model with technopolis as the core product has been established to provide integrated services of technopolis planning, investment, construction and operation. Possessing strong capabilities in industrial planning, investment and operation, Xinchuang Tech is devoted to be a world leader in inclusive development of technopolis.

FURTHER INFORMATION ABOUT XINCHUANG TECH ▶

Sparse decomposition of arrays

Genome-wide association studies (GWAS) aim to identify components of the human genome sequence that contribute to variations in physiological traits resulting from differences in gene expression. Identifying these components can help us better understand the molecular mechanisms underlying diseases and allow clinicians to formulate more appropriate therapeutic strategies. The data generated from GWAS can be difficult to interpret without the aid of sophisticated computational and statistical tools.

Oxford researchers have developed software using the Bayesian framework to decompose 3D arrays (or tensor) of multiple-tissue experiments to uncover gene networks linked to genetic variation. The software is validated by the application in the analysis of RNA sequencing data from 845 individuals from the TwinsUK cohort.

FULL WEB PROFILE ▶

Smart mouthguard

Safety in sport has become of great concern, as more people than ever are involved in contact sports at every level. Protective equipment, like mouthguards, are considered mandatory in sports such as rugby, American football and boxing.

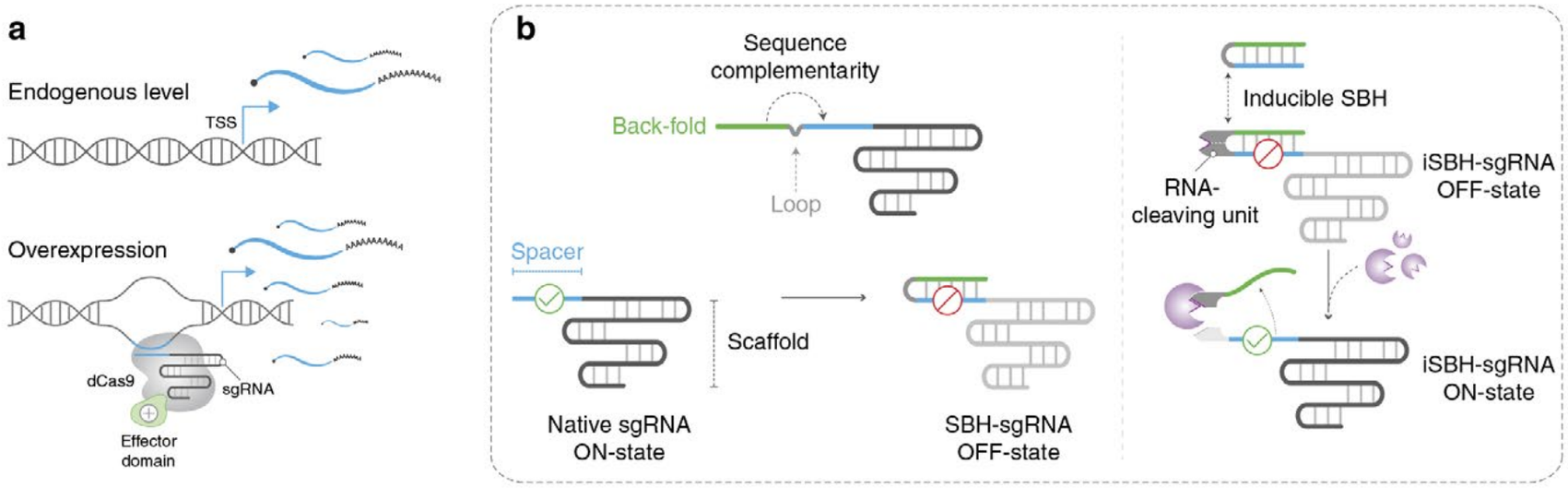
Researchers based at Oxford University have developed a smart mouthguard, which allows wearers to monitor and track their performance and physical exertion on the field. By feeding back data to a central source it is possible to observe extreme physical exertion during sports before it leads to injury. The information can also be used to customise training regimes.

FULL WEB PROFILE ▶

Highly efficient CRISPR-TR platform

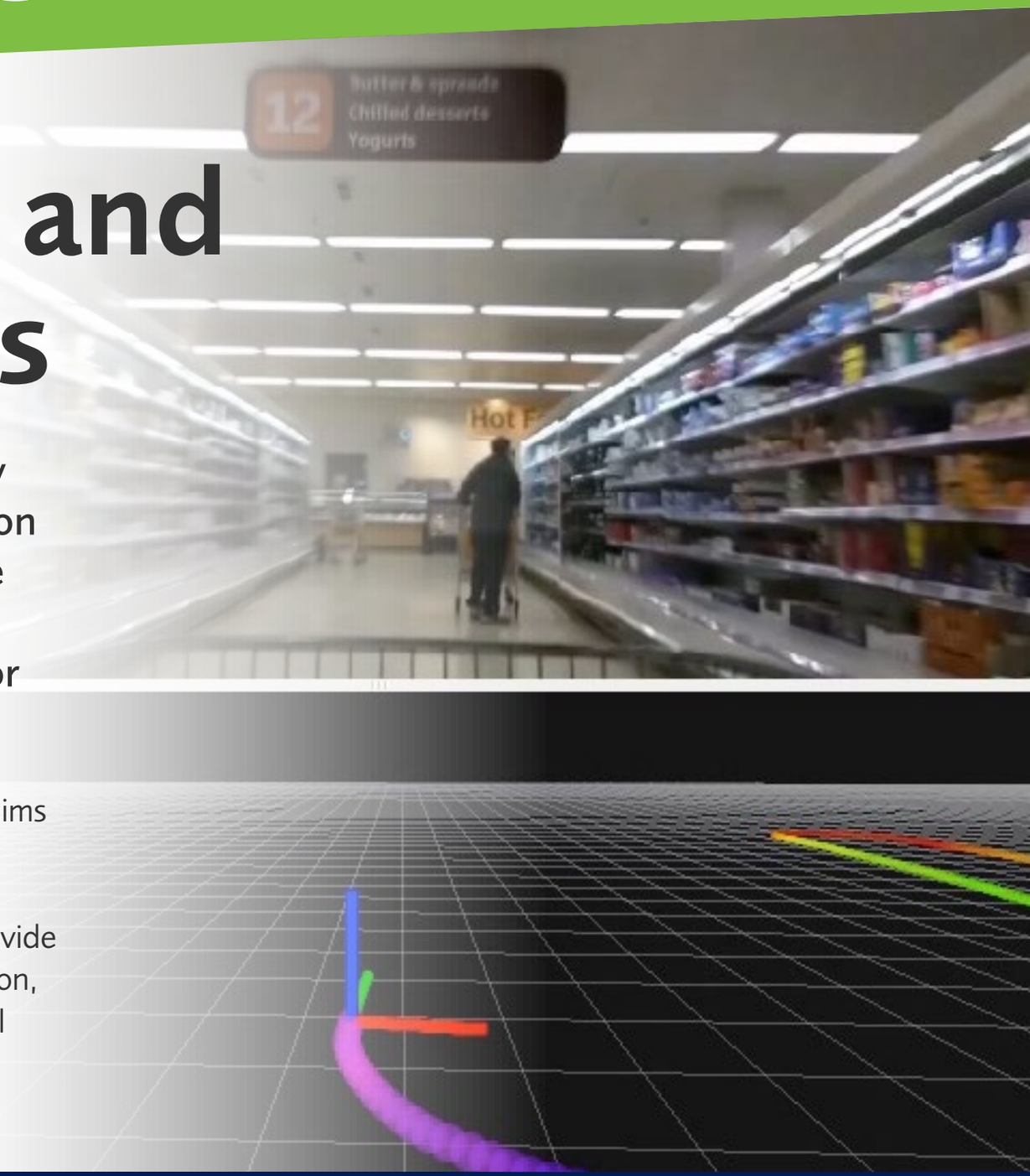
CRIPSR-based transcription regulators (CRISPR-TRs) can be used to control the expression of any gene of interest by simply reprogramming its associated single guide RNA and tethering various effector domains to the dCas9 protein. Current inducible CRISPR-TR systems require complex protein engineering and cannot be scaled up to create transcriptional programmes involving multiple genes.

Oxford researchers have developed a versatile inducible CRISPR-TR platform by engineering the single guide RNA and have devised a system of inducers to regulate the activity of CRISPR-TR. This system enables the regulation of target gene expression at any space and time and the assembly of complex gene circuits. It has wide applications in synthetic biology and the development of cell-based therapeutic strategies.



FULL WEB PROFILE ▶

Mobile positioning and tracking techniques

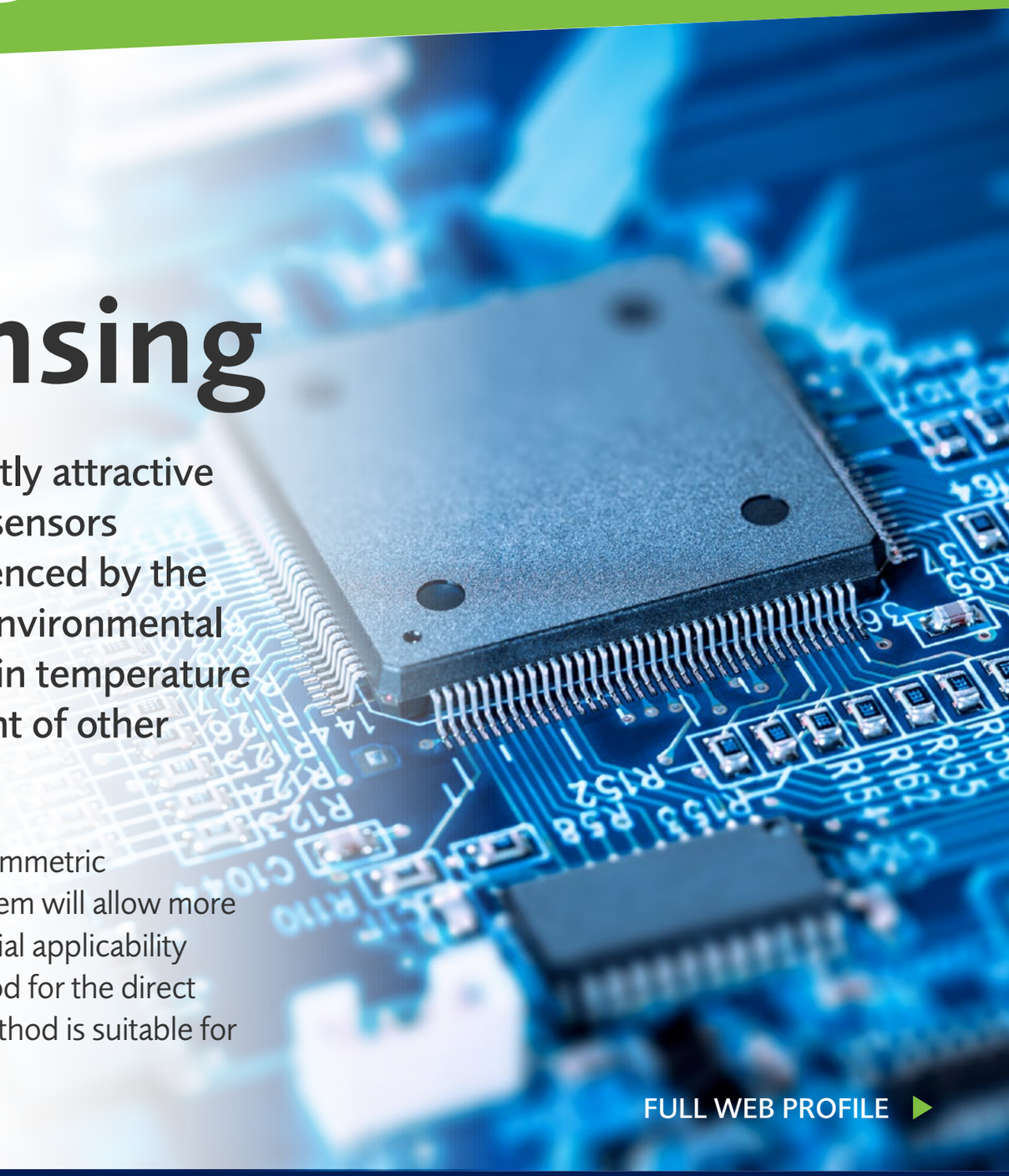


Visual odometry is the process of using images, obtained by an onboard camera, to determine the position and orientation of a device. Although widely adopted in the fields of mobile robotics and space exploration, this method has several drawbacks, including the need for extensive calibration prior to each use.

Researchers at the University of Oxford have developed visual odometry algorithims based on a machine learning approach, which are robust and do not require calibration. They are also able to incorporate inertial data from an IMU (inertial measurement unit), where present, via a visual inertial odometry algorithm to provide a more accurate estimation of position and orientation. In the absence of calibration, the Oxford approach proves to be significantly more effective than all other visual odometry algorithms.

FULL WEB PROFILE ▶

Highly sensitive electrochemical sensing



Electrochemical sensors for the detection of gases are inherently attractive due to their high sensitivity and low cost. All electrochemical sensors depend on an electron transfer step, the rate of which is influenced by the local environment. Temperature and humidity are important environmental factors that affect this rate. It is important to monitor changes in temperature and humidity, as they can indirectly influence the measurement of other properties such as the quantification of chemical species.

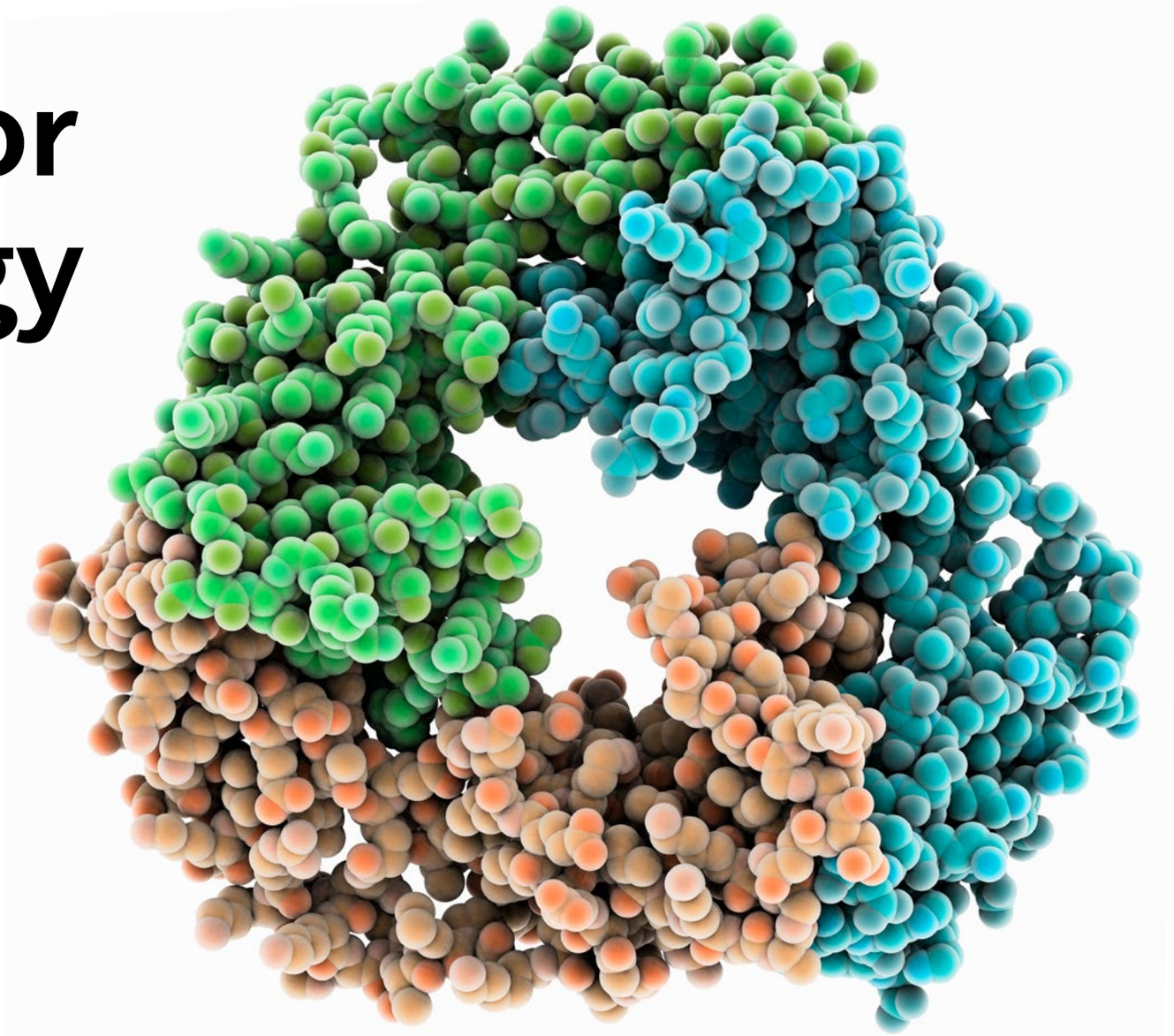
Oxford researchers have developed an electrochemical sensor with a built-in voltammetric thermometer, removing the need for thermostated operating conditions. This system will allow more accurate gas sensing over a range of temperatures potentially increasing commercial applicability of electrochemical sensors. Furthermore, the researchers have developed a method for the direct detection of temperature and humidity at the electrode solution interface. This method is suitable for integration with other voltammetric sensing methods and analytical probes.

FULL WEB PROFILE ▶

A flexible tool for structural biology

Determining the structure and function of biological macromolecules requires a swathe of intricate techniques, which produce large amounts of data. Analysis of this data is often carried out using a disconnected group of distinct software packages. Workarounds are then required to improve workflow.

Researchers at the University of Oxford have developed BiobOx, a structural biology tool, which allows users to analyse and manipulate protein structures, incorporating data from electron density maps and collisional cross sections. BiobOx can assess structures from the atomic level, right up to complex, multimeric quaternary structures.



FULL WEB PROFILE ▶

The Oxford RobotCar dataset

The mapping of changing environments is a significant challenge in the race to develop autonomous vehicles.

Critical to development is the availability of large quantities of real-world data, which is used to develop, test, and validate algorithms ahead of successful deployment. Currently, available datasets do not address the challenges of long-term autonomy.

The University of Oxford Robotics Institute has recorded over 20TB of image, LIDAR, and GPS data by repeatedly traversing a route in central Oxford in the Oxford RobotCar. This unique dataset, captured over one year, features a large range of variation in scene appearance and structure. The dataset is available to license for commercial use from Oxford University Innovation and will enable the development and testing of long-term mobile autonomy solutions.

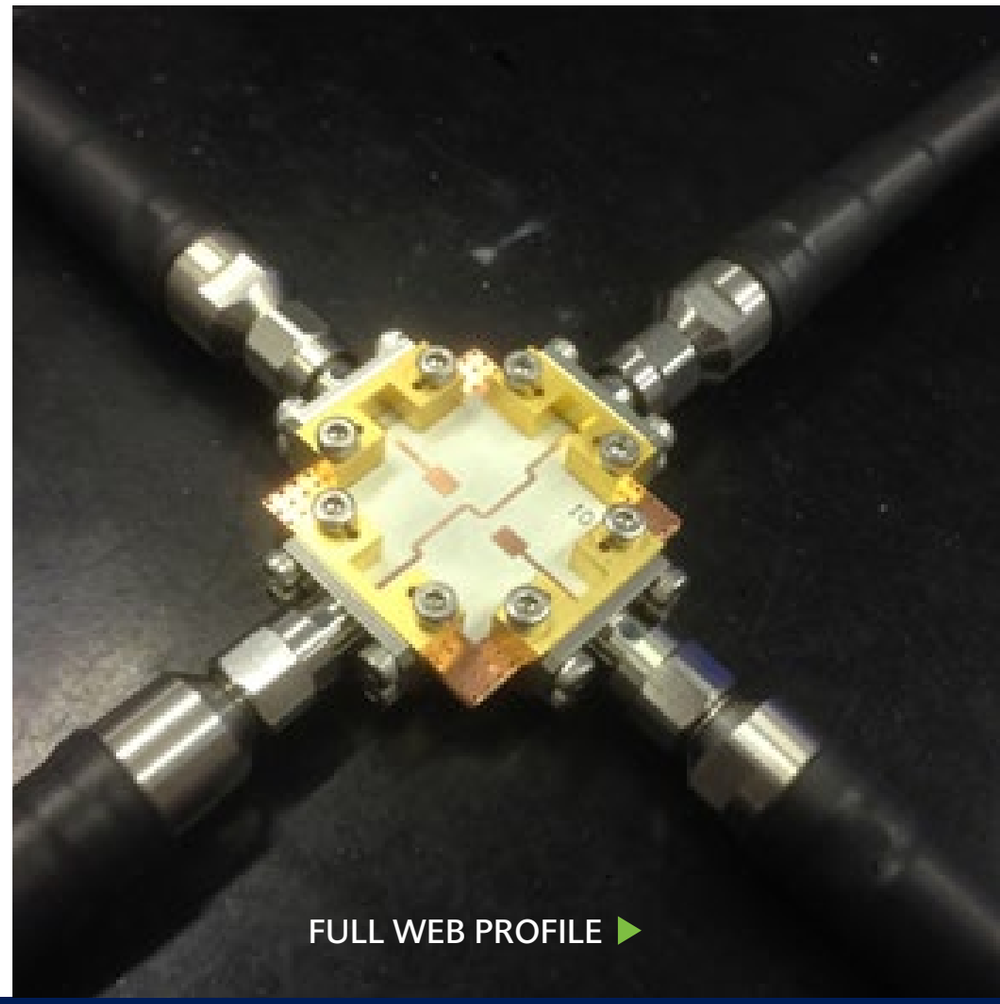
FULL WEB PROFILE ▶

Novel signal cross coupling method

Signal couplers allow signals from two transmission lines to be combined and/or split, and can be used in a variety of applications including power distribution networks, sensor arrays and astronomical instrumentation.

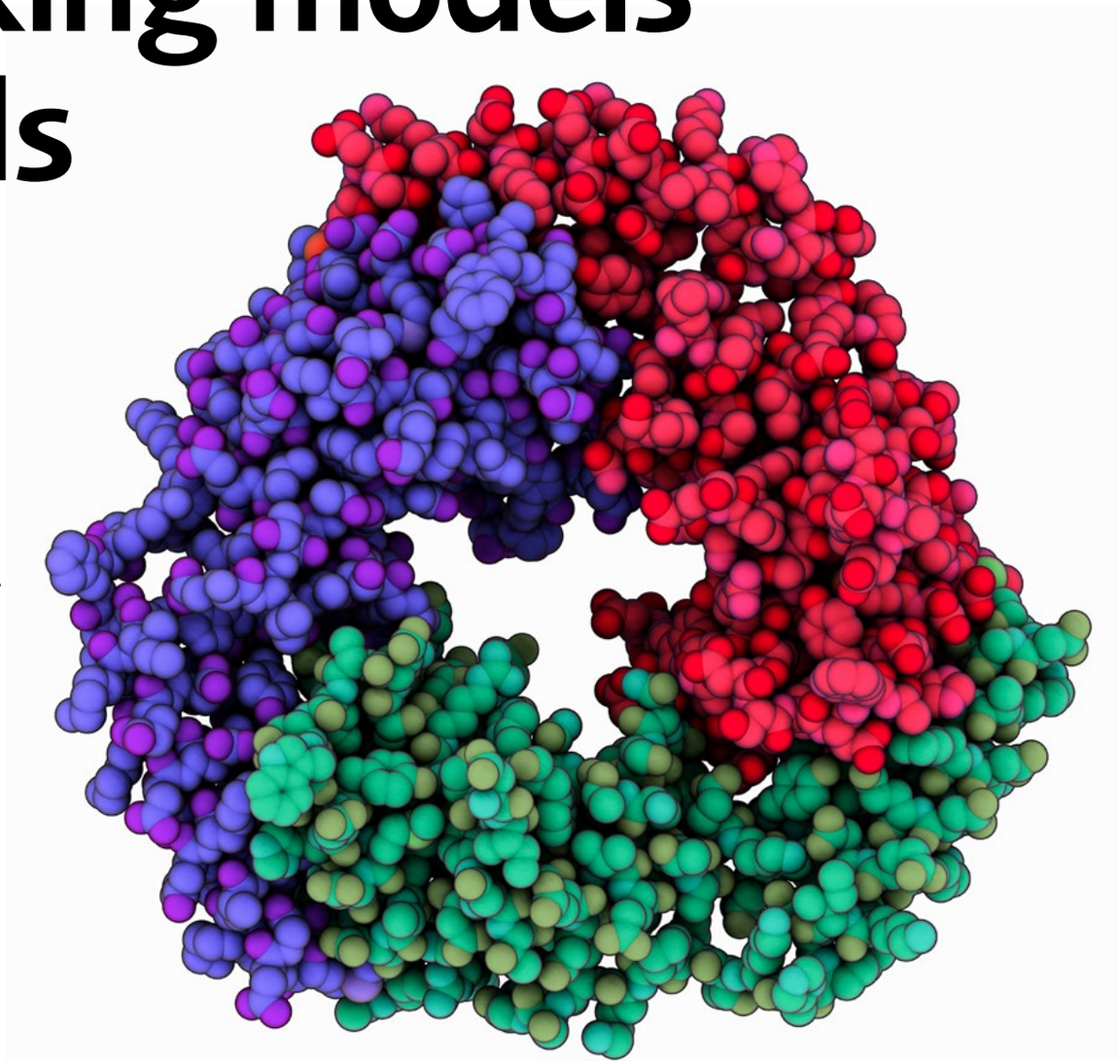
Conventional couplers have both transmission lines, which carry the signal, running in parallel to each other, which makes them unsuitable for circuits that require signal path crossing or bypassing, particularly in applications in linear arrays. Traditionally this is overcome by using cross-guide coupler, additional cabling or series of optical free-space beam splitters. These solutions are often bulky and space-consuming. Furthermore, it is difficult to integrate them with standard planar circuits.

Oxford University academics have recently developed a signal coupler with crossed transmission lines in planar circuit form, which results in a much more compact device that is much easier to manufacture. The coupler can easily be integrated directly into a wider range of circuitry on printed circuit boards. This could have a major impact on how one can design and simplify complicated circuitries that require multiple signal couplers, reducing the size of components and improving their performance.



FULL WEB PROFILE ▶

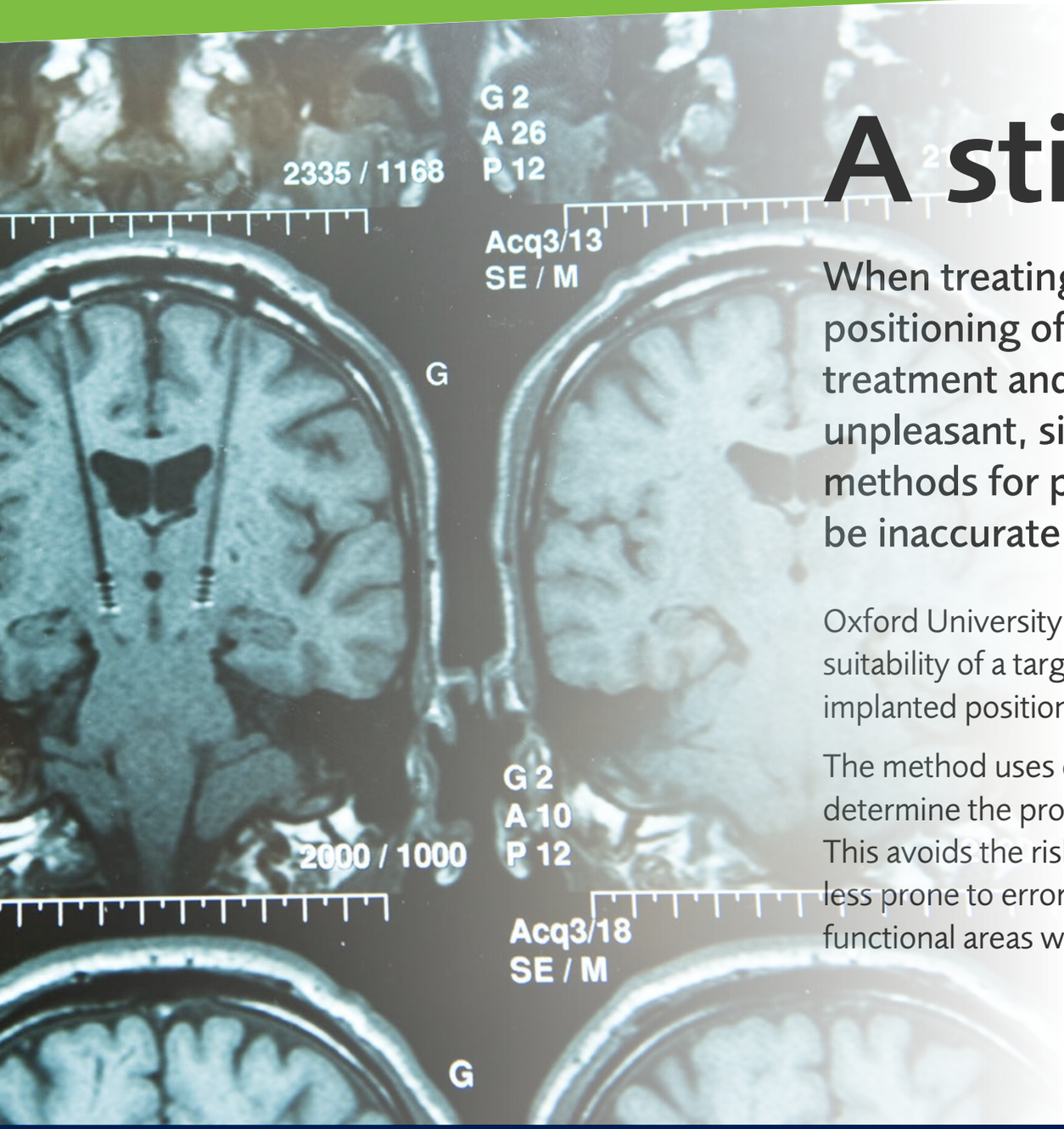
Improving cross-linking models between amino acids



The structure of a protein informs us about the potential functions of the components of the protein, its relationship with other molecules and its physiological relevance. Identifying cross-links (or covalent links) between amino acids in a protein is crucial to establish the structure of protein assemblies and the association between the subunits.

Oxford researchers have developed software that can more precisely model cross-links between amino acids in a protein by accounting for the dynamics of the linker and amino acid side chains. Models generated from this software can be used to more accurately determine protein structures and significantly improve protein-protein docking.

FULL WEB PROFILE ▶



A stimulating solution

When treating patients using deep brain stimulation, precise positioning of DBS electrodes is crucial for optimising treatment and minimising the risk of undesirable, possibly unpleasant, side effects. Unfortunately, current available methods for positioning DBS leads are prone to error and can be inaccurate, compromising patients' treatment and recovery.

Oxford University researchers have developed a method for assessing the suitability of a target for deep brain stimulation (DBS) and for observing the implanted position of a DBS lead.

The method uses electrophysiological signals obtained from multiple electrodes to determine the proximity of an implanted DBS lead to a target implantation position. This avoids the risk of adverse side effects caused by incorrect positioning and is less prone to error than current methods. It is also less time consuming and allows functional areas within a neurological structure to be determined.

FULL WEB PROFILE ▶

Understanding treatment benefits and harms with systematic reviews

The media bombards us with headlines about new drugs, diets, and surgical techniques that are supposed to revolutionise our health. The promised benefits are rarely delivered, because predictions are often based on single, anomalous studies. Identifying interventions that are both safe and effective requires a systematic search of all available evidence in the form of a 'systematic review'.

The Nuffield Department of Primary Care Health Sciences is a world leader in the methodology and production of systematic reviews. Conducting systematic reviews can support strategic decision-making, including whether to invest further in a technology, and specifing additional evidence required in order to secure regulatory approval.

OUI Consulting Services has arranged for Dr. Jeremy Howick to review evidence for surgical techniques, he has authored systematic reviews of neuraminidase inhibitors, placebo effects, positive communication, and other interventions.

FURTHER INFORMATION ▶

Precision 3D displacement sensing

In situ monitoring of civil structures such as bridges, pavements and railways forms a key component of failure warning systems. Present monitoring methods use indirect measurements or mechanical components that are prone to failure.

Researchers at the University of Oxford have developed a device that uses low-frequency magnetic fields to track the 3D displacements present in materials such as concrete and soil. With a positioning accuracy of better than 1mm, this device could find utility in a wide range of situations, from structural health monitoring to process and manufacturing control.

FULL WEB PROFILE ▶

A new tool for characterising water permeation across films

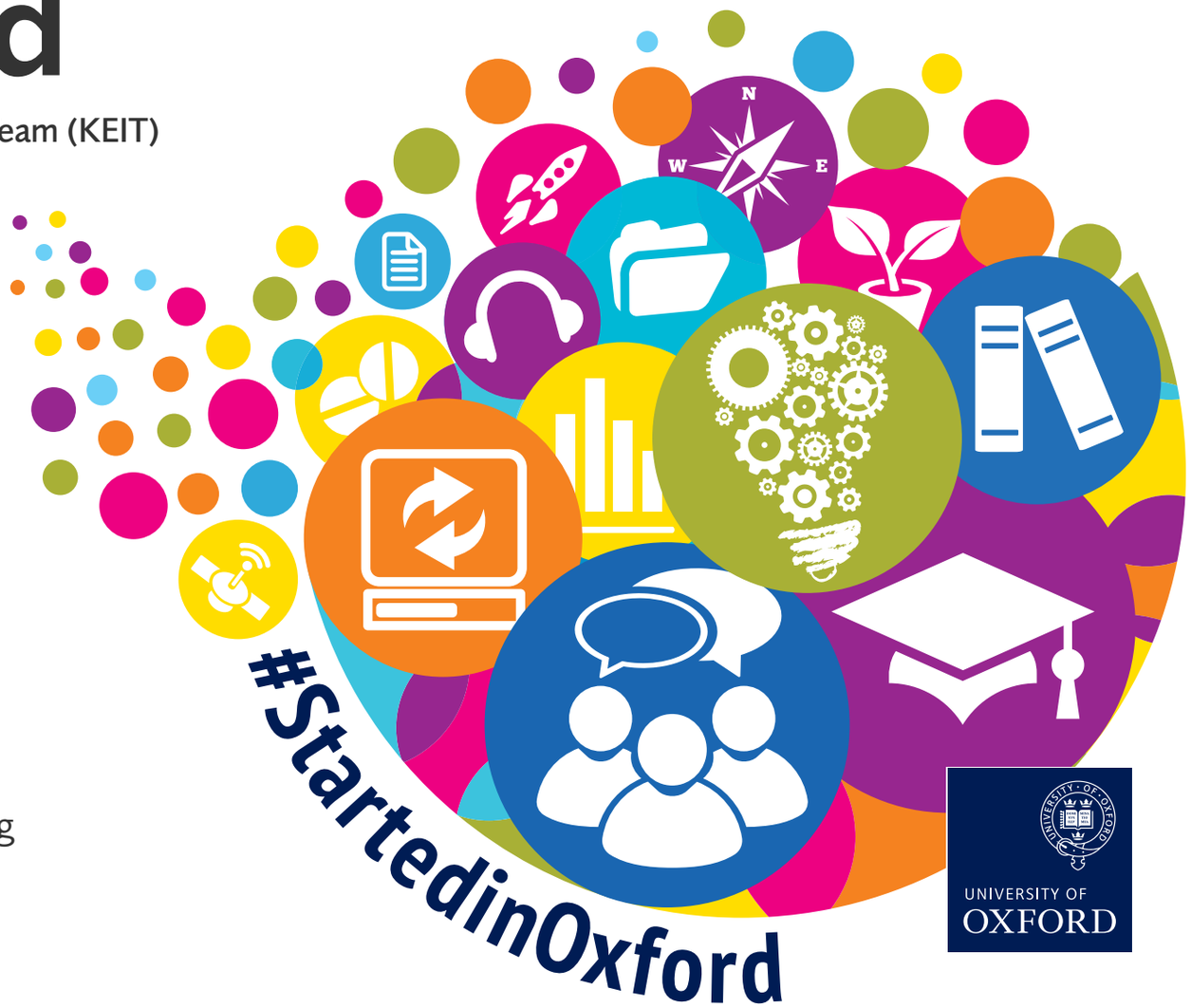
Sectors including food packaging and optoelectronics (e.g. OLEDs and OPVs) require materials that prevent the ingress of moisture. Assessing the permeation of water through such materials is, therefore, a key factor in product development. As a result, there is increasing interest in understanding water permeation and how this varies with different thin film materials.

Researchers at the University of Oxford have conceived a new method to study water vapour permeation through films. The technique allows the determination of the degree of permeation and the mechanism by which it occurs. Sample preparation is also simple and can be carried out without the need for a dry box or clean room.

FULL WEB PROFILE ▶

#StartedinOxford

Article contributed by colleagues in the Knowledge Exchange & Impact Team (KEIT)



What do you think of when you hear the word 'Oxford'? Beautiful old colleges? Brilliant scholars and students? Morse? The list could be endless. One aspect of Oxford that has sometimes lacked the attention it deserves is the number of new companies gestated in the city, many with support from the University.

To tell the story of innovative Oxford we started using the hashtag #StartedinOxford a few years ago – take a look online – and encouraged spinouts, startups and others in the cluster to use it to demonstrate the number and quality of new ventures that have been created here, making a significant contribution to the local and national economy.

So when our colleagues in the University planned a series of events to mark Global Entrepreneurship Week, the name chose itself – #StartedinOxford, of course.

CONTINUED ▶

Global Entrepreneurship Week

In the run up to Global Entrepreneurship Week social media was buzzing with stories and examples of businesses, ideas and people that #StartedinOxford

The excitement crossed from the online world to the real one with the #StartedinOxford Demo Night – a showcase event with startups, spinouts and social enterprises from both universities and across Oxfordshire.

The doors of the Weston Library opened to an eager crowd who had queued round the block to find out more about the 27 startups on show. Each attendee was given 1000 #StartedinOxford dollars to "invest" in the company they liked the most. It was a great way to encourage people to discover the details of each startup.

After a welcome by Pro-Vice Chancellor Professor Anne Trefethen, investors were left to meet the founders and entrepreneurs.

The theme of "queues" stayed throughout, with attendees waiting in lines to meet startups! With businesses ranging from battery power to cricket flour, baby monitors and energy bars to med-tech and digital platforms, there truly was something for everyone.

The hall was absolutely buzzing all evening; everyone had a great time, meeting new friends and catching up with old ones as well. There were plenty of demonstrations, discussions, and exchanging of cards and information.

Apart from the lively startup scene what was also evident was the amount of support available for new entrepreneurs in Oxfordshire - from accelerator programmes and co-working spaces to professional service providers, training and mentorship.

CONTINUED ▶

At the end of the evening each team's #StartedinOxford dollars were counted. The top three were:

- Fairfull, a social enterprise that creates delicious food products with flavours and inspirations from around the world and uses profits to fuel positive change in the country of the food's origin ▶
- The Curiosity Box, the first STEM subscription box for kids in the UK, inspiring children to think and create ▶
- First prize went to Greater Change, a mobile donation system that enables members of the public to give directly to support a homeless individual. ▶

The #StartedinOxford stories have continued online so why not join the conversation?

#StartedinOxford Storify ▶
Started in Oxford ▶
A Grand Night for Startups ▶

@MikeFozOxford

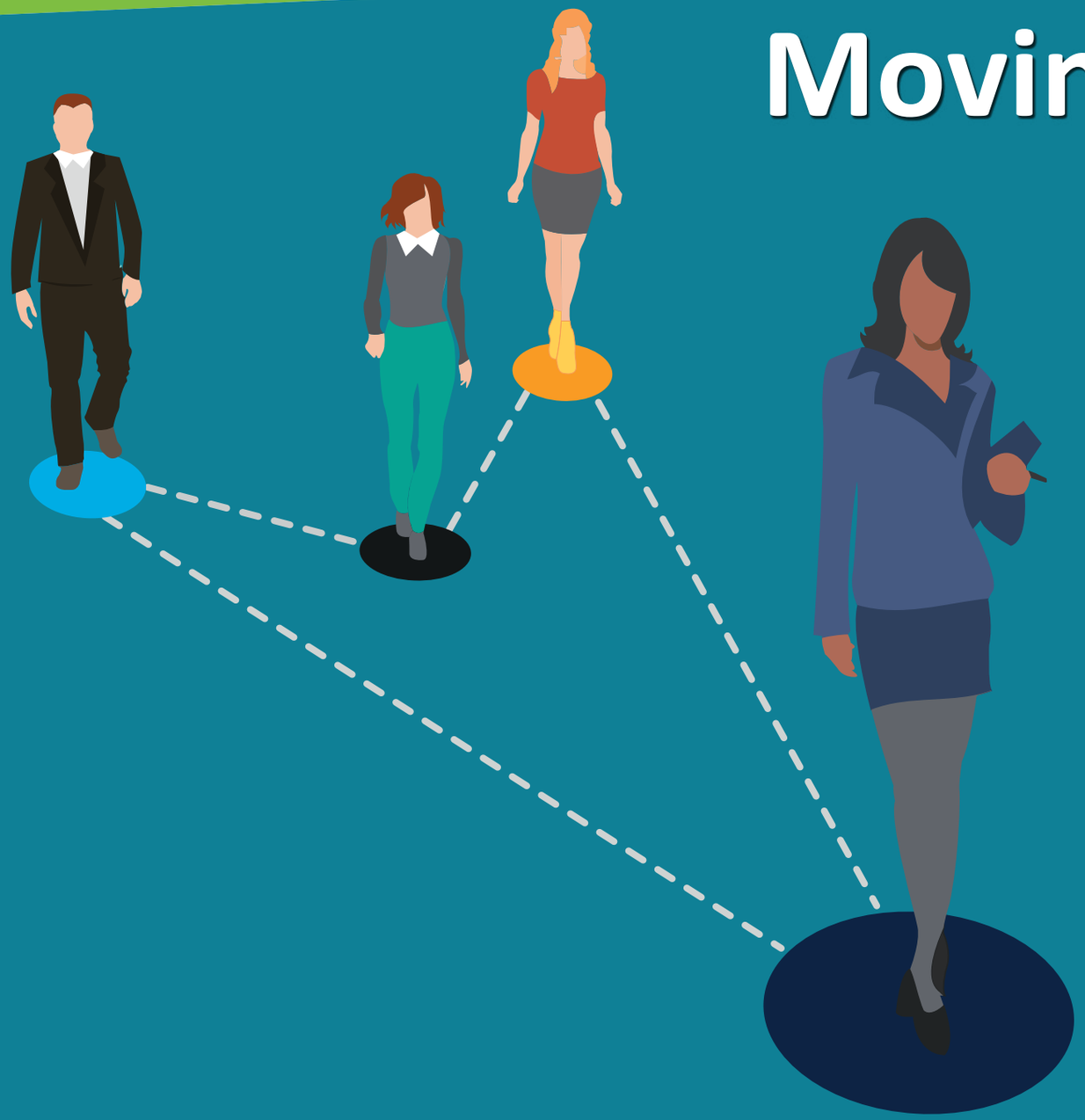
Congrats to all involved with #StartedinOxford demo night. A fantastic showcase for #Oxford #Entrepreneurs & #StartUps

@ElPrice92

Great evening meeting all the exciting startups coming out of Oxford at the #StartedinOxford demo night, thank you @enterprisingox for a great event! #startups #oxford

@_nigelbenton

One of the most fun networking nights I've been to. I'm an investor!!! Thank you @enterprisingox



Moving forward with you

Providers of innovative banking, legal, accountancy and business advisory solutions for technology based businesses in Oxford and beyond.

PENNINGTONS MANCHES

Nicola McConville, Partner, Corporate
T: 0118 982 2654
E: nicola.mcconville@penningtons.co.uk

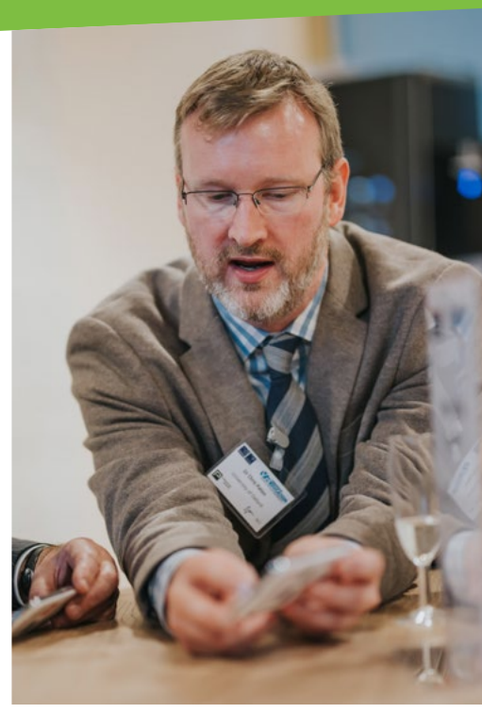
JAMESCOWPER KRESTON
Accountants & Business Advisers

Sue Staunton, Partner - Technology Group
T: 01865 200 500
E: sstaunton@jamescowper.co.uk

BARCLAYS

Andrew Davies, Corporate Director
T: 0777 554 8803
E: andrew.j.davies@barclayscorporate.com

INNOVATION insights



OXFORD INNOVATION SOCIETY 2018

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

- Thursday 15 March
- Thursday 21 June
- Thursday 27 September

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

INNOVATION insights

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

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

Designed and produced by www.imageworks.co.uk