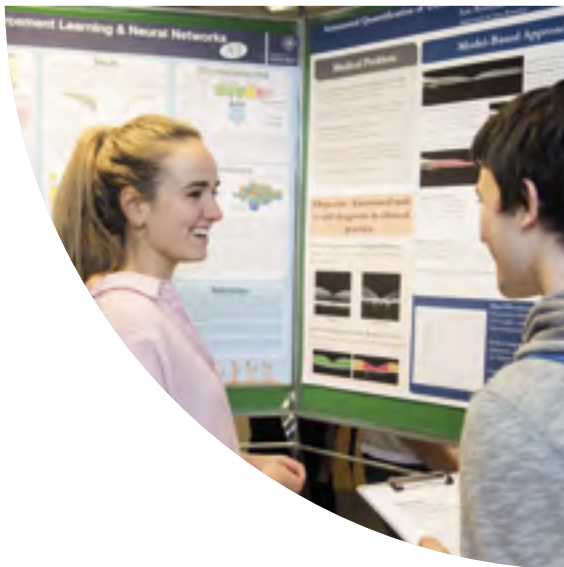DEPARTMENT OF
ENGINEERING
SCIENCE

UNIVERSITY OF
OXFORD

DEPARTMENT OF ENGINEERING SCIENCE NEWSLETTER

ISSUE 8: 2018

THE QUEEN'S
ANNIVERSARY PRIZES
FOR HIGHER AND FURTHER EDUCATION
2015

Supported by
Rolls-Royce

INSIDE THIS ISSUE:

News from the Head of Department

The top Engineering Department in the world

On the last day of November this year, the Times Higher Education (THE) Supplement announced the world rankings for Engineering and Technology. To quote from their press release: "The 2019 engineering and technology ranking has expanded to include 903 universities, up from 501 last year. The University of Oxford leads the table for the first time, after overtaking Stanford University and the California Institute of Technology." There are several league tables for University Departments, but the THE world rankings are generally considered to be the most reliable. There is no doubt that this is a huge accolade for the Department and a wonderful endorsement of our teaching, research and innovation. (For those of you who are interested, the weightings for the engineering and technology ranking are worked out as follows: Teaching (the learning environment): 30%; Research (volume, income and reputation): 30%; Citations (research influence): 27.5%; International outlook (staff, students and research): 7.5%; and Industry income (innovation): 5%.)

The international outlook of the Department was also prominent at the opening of Oxford's first overseas research centre for physical sciences and engineering in Suzhou, one hour from Shanghai, on 22nd November. The Centre Director, Professor Zhanfeng Cui, is Professor of Chemical Engineering in this Department. The Oxford-Suzhou Centre for Advanced Research, known as OSCAR, will house the research laboratories of 12 academics from Oxford, 8 of whom are from this Department. Research activities will initially focus on health informatics, tissue engineering, biomedical imaging techniques, environmental remediation, advanced materials and electronic devices.

There are many other research highlights from the Department in this newsletter, but I would draw your attention to the news item on the introduction of 3D printing into the undergraduate teaching curriculum (page 3). After my presentation during the alumni weekend in 2015, I was approached by an alumnus who took me to task because he felt very strongly that modern engineering undergraduates should be exposed to 3D printing technologies during their degree course. Three years later, I am delighted to say that the Department has invested half a million pounds in responding to this challenge, with a dedicated facility housing eighteen 3D printers and scanners on the fourth floor of the Thom building.

Regardless of what happens with Brexit (which at the time of writing is not clear), the Department is also maintaining its strong links with engineering institutions in the European Union. I am very pleased that Dr Sophie Mougard, the Director of the École des Ponts ParisTech (originally called École Nationale des Ponts et Chaussées or ENPC), has accepted my invitation to give the 2019 Lubbock lecture. ENPC, founded in 1747, is the oldest civil engineering institution in the world, and it will be fascinating to hear Dr Mougard talk about the past, present and future of civil engineering. I hope to see many of you at her lecture on Wednesday 22nd May 2019.

Front cover (clockwise from top right): Oxford Robotics Institute data collection in Iceland, image Ady Powell (page 8), Professor Tarassenko and alumni at the 2018 Lubbock lecture drinks reception, one of our outreach events for secondary school students (page 12), the Thom Building

3D printing

3D printing, also known as additive manufacturing, has become one of the key technologies in engineering, enabling parts to be designed on a computer using a 3D model and manufactured within a few minutes.

With input from Professor Stephen Payne and Bob Scott (Head of the Teaching and Design Support Group) and under the direction of Professor Alfonso Castrejon-Pita, who is an expert on ink-jet printing down to the nano level, the Department has recently set up a 3D printing laboratory on the 4th floor of the Thom building. This is a large facility, with machines from entry level to advanced research machines.

Eighteen 3D printers and 3D scanners have been purchased and these will be available to students throughout the course, along with research-grade cutting-edge systems which allow printing resolutions down to 15 microns over areas as broad as 900cm^2.

A new feature of the laboratory will be the availability of this space to all members of the department for their own projects, either individual or group. The intention is to provide, for the first time, a space for members of the department to be able to explore ideas and to create objects that are not explicitly part of a course syllabus or a funded research project.

CONTENTS

Upcoming Events

Alumni Weekend 2019

As part of the 2019 Oxford University Alumni Weekend (20th-22nd September) we will hold the annual Jenkin Lecture on Saturday 21st September - the speaker will be announced nearer the time.

The day will also include:

- building tours for Alumni
- an update from the Head of Department
- a talk by the winner of the 2019 final-year undergraduate project prize
- the Oxford Engineering Alumni (OEA) Annual General Meeting

There will also be the chance to meet academics from the Department and fellow alumni over drinks and canapés. Be sure to keep an eye on the Alumni and Events pages of our new website www.eng.ox.ac.uk for updates.

The 45th Maurice Lubbock Memorial Lecture 2019

The Lubbock Lecture will be held at the Mathematical Institute on 22nd May 2019, with Dr Sophie Mougard, the Director of the École des Ponts ParisTech (www.enpc.fr/) who will talk about the past, present and future of civil engineering. The lecture will be followed by a drinks reception.

Mosquito-detecting app uses volunteers to develop early warning system

Researchers in the Departments of Engineering Science and Zoology, and from Kew Gardens, have developed a way of alerting people to the presence of mosquitoes with an app that detects their distinctive buzz.

Mosquito-transmitted diseases are responsible for an estimated one million deaths each year, of which the vast majority are concentrated in sub-Saharan Africa. Although global malaria cases have declined since 2010, they are now on the increase again.

The HumBug app runs on a cheap mobile phone, analysing sounds in the environment and issuing a warning when mosquitoes are nearby. To develop the early warning system, the project team converted recordings of mosquito sounds into frequency features and trained an algorithm to learn the signature pattern created by mosquitoes in flight.

The next phase of development is to improve the analysis so that it can differentiate between malaria-carrying species of mosquitoes and their more harmless relatives – only around 70 of the 3500 mosquito species are responsible for spreading malaria. The app should be able to learn the tell-tale audio signatures produced by different species based on variations in sound caused by wing size and shape.

During this phase researchers need to process hundreds of hours of recordings in the wild and in labs. They are enlisting members of the public to help with this task by analysing short audio clips for mosquito sounds.

The project, led by Professor Stephen Roberts (Department of Engineering Science) and Professor Kathy Willis (Department of Zoology, formerly Director of Science at Royal Botanic Gardens Kew and now back in Oxford as the new Principal of St Edmund Hall), has already shown that the app could detect the presence of mosquitoes from about 10cm away, depending on background noise. The Humbug Project is funded by a Google Impact Challenge award and the ORCHID project.

"Hopefully this will save lives," said Yunpeng Li, one of the research assistants working on the project. "If we can identify the species, we can tell people in areas where there is malaria that these mosquitoes are around and that they need to take care, to use bed nets and so on."

The app has further development potential beyond warning people of nearby mosquitoes, say the team. Traditional mosquito surveys are expensive and time consuming and they put scientists in the field at risk of catching diseases. The new app could enable researchers to build up real-time maps of mosquito populations, and scientists in the field could identify mosquitoes more safely and easily.

Nanoengineering of smart photonic sensors

Crime, terrorism prevention, environmental monitoring, re-usable electronics, medical diagnostics and food safety, are just a few of the far-reaching areas where a new chemical sensor could revolutionise the state of the art.

Engineers at the University of Oxford have used nanoscale hybrid materials known as Metal-Organic Frameworks (MOFs) to develop technology that senses and responds to stress, temperature, light and chemicals. The material visibly changes colour depending on the external stimuli detected.

Oxford's research could be used to develop MOF based devices at low cost, enabling a variety of innovative

0.5 ml acetone was prepared in a 20 ml glass vial for acetone vapour exposure demo

applications such as wearable personal protection devices, anti-counterfeiting technologies, and re-usable optics-based luminescent sensors for protection against harmful environments, such as nitro explosives and toxic gases.

Professor Jin-Chong Tan, who leads the Multi-functional Materials & Composites (MMC) Lab, says: "This new material has remarkable physical and chemical properties that will open the door to many unconventional applications. MOF materials are getting smarter, and with further research can be useful for engineering intelligent sensors and portable multi-functional devices."

Recently, this ground-breaking research has led to the award of a prestigious European Research Council (ERC) Consolidator Grant of €2.4 million to Professor Tan.

Watch the video at https://youtu.be/r7lx1Vmbxf4

Partnership with Oxford Bus Company locates 'pollution hotspots' in Oxford City Centre

Researchers from the Department of Engineering Science are collaborating with the Oxford Bus Company to conduct a detailed emissions study on buses across the city.

Dr Felix Leach, Postdoctoral Research Assistant and newly appointed as Associate Professor in the Department (with a Tutorial Fellowship at Keble College), has been measuring NOx emissions on buses on key routes operating within the city. NOx (oxides of Nitrogen) is formed when combustion occurs in the presence of nitrogen at high temperature, and is harmful to human health, particularly those with existing heart and lung conditions.

NOx levels in Oxford vary significantly, with some areas – particularly those with heavy traffic - having high levels. Using highly accurate Global Positioning Systems (GPS), Dr Leach's emissions measurements can identify exactly where NOx is emitted to within 30cm. The study will help establish exactly where in Oxford NOx is being produced and whether any changes, such as better road layouts or revised traffic calming, can be made to reduce levels.

Dr Leach says: "The accurate real-world data that we have collected is allowing our research team to identify the precise locations and causes of NOx emissions in the city – be they due to the placement of a speed-bump or a set of traffic lights. The understanding gained from this data will enable the development of more effective operating strategies for NOx reduction, which should lead to improved air quality for everyone."

New approach for monitoring historic buildings attracts coveted prize

An innovative new approach for monitoring historic buildings during upgrades to the London Underground has been recognised for its outstanding real-world impact at the *New Civil Engineer Magazine's* TechFest in September.

The method was devised during a project led by Professor Sinan Acikgoz, an Associate Professor in Civil Engineering, which investigated potential damage to grade 1 listed buildings, St Mary Abchurch and Mansion House, during construction of tunnels leading in and out of Bank underground station. The movements induced by the excavation had the potential to cause damage to these

Dome of St Mary Abchurch, London EC4. Photo © John Salmon (cc-by-sa/2.0)

important structures, and this demanded extensive monitoring in real-time.

The research team laid strain-sensing fibre optic cables across the buildings' walls and vulnerable architectural features, such as the painted dome on the church roof. An interrogator fed pulses of light through the cables, analysing the resulting wavelengths to measure emerging strain levels around the structure during the excavation. This data was used to warn the construction team whenever ground movement caused the strain to exceed critical levels and risked causing structural damage.

Professor Sinan Acikgoz started the project whilst an 1851 Fellow at the Centre for Smart Infrastructure and Construction in Cambridge and continues to lead the research team now that he is in the Department in Oxford.

Department signs five-year agreement with Ørsted to optimise wind turbine foundations

During 2018 the Department of Engineering Science and renewable energy company Ørsted signed a five-year research framework agreement to optimise the design of foundation structures for offshore wind turbines.

The agreement also sees Ørsted supporting a Royal Academy of Engineering Research Chair in Advanced Geotechnical Design held by Professor Byron Byrne.

Ørsted has 11 offshore wind farms in the UK and plan to expand their supply to the equivalent of 4.4 million homes by 2020. They recently completed the world's largest offshore wind farm in the Irish Sea off the coast of Cumbria, Walney Extension, which itself has a capacity of 659 megawatts (c. 600,000 homes). It has even larger schemes in the works: Hornsea One and Two, off the Yorkshire coast, will supply 2,600 MW between them.

Christina Aabo, Head of R&D at Ørsted Wind Power, says: "This partnership will enable us to further mature our foundation designs to support even bigger turbines in even deeper waters, lowering costs and risk level at the same time."

Continuing to drive down costs is critical for the offshore wind industry. Wind turbine foundations contribute significantly to the overall capital costs, and more advanced geotechnical designs for those foundations can make a significant impact.

The research taking place under this new framework agreement will develop, extend and embed new geotechnical design ideas into well-defined engineering methods for offshore wind power. The focus will be on cyclic loading, which is an important element of safe design, especially for deeper water and larger turbines.

Cyclic loading is the repeated stress caused by the action of wind and waves on the structure, as well as by the operation of the turbine. The research activities will deliver new design methods to address this loading, through doctoral and post-doctoral research projects, including theoretical development, soil laboratory testing and medium-scale field tests.

At the recent Alumni Weekend, Professor Byrne gave the 2018 Jenkin Lecture and talked about the engineering challenges involved in designing bigger and more efficient offshore wind turbines (see page 16).

EPSRC-funded Research and Industry partnership to boost engine research

The Engineering and Physical Sciences Research Council (EPSRC) recently announced the second round of business-led Prosperity Partnerships linking research with industry.

The Department of Engineering Science is one of the collaborators in a project with Rolls-Royce, led by the University of Edinburgh. Professors Nik Petrinic and Antoine Jérusalem of the Department's Solid Mechanics Group are spearheading Oxford's involvement, along with Professors David Hills and Alexander Korsunsky.

The Strategic Partnership in Computational Science for Advanced Simulation and Modelling of Engineering Systems (AsiMoV) will seek to develop the next generation of engineering simulation and modelling techniques, with the aim to develop the world's first high-fidelity simulation of a complete gas-turbine engine during operation.

Clinical trial confirms machine perfusion technique improves liver transplant outcomes

In last year's newsletter, we reported on the ground-breaking method of preserving livers at body temperature (normothermic perfusion) developed by OrganOx Ltd, a spin-out from the University of Oxford by Professor Constantin Coussios (Institute of Biomedical Engineering) and Professor Peter Friend (Nuffield Department of Surgical Sciences).

Since then a paper published in and featured on the cover of the journal Nature has detailed the findings of the first randomized control trial of its kind comparing conventional cold storage with the OrganOx technique in 220 liver transplant patients between June 2014 and March 2016.

Once a suitable liver was allocated to a recipient, it was randomized to either conventional storage or normothermic perfusion (NMP). The NMP liver was attached to the OrganOx metra NMP device, where it was perfused throughout the duration of preservation until the transplanting surgeon was ready to implant it. The remainder of the recipient's care followed standard practice.

Post-operative biochemical results were recorded as well as graft and patient survival data.

The study found that normothermic perfusion increases the number of viable donor livers available for transplant, preserving them for longer and reducing degradation of the organ in storage. The benefit was most pronounced in donor livers that were deemed to have a higher risk of failing.

Comparing 120 warm-preserved to 100 cold-preserved liver transplants, the researchers found a 50% reduction in serum aspartate transaminase in the NMP livers. (This enzyme is a clinically accepted biomarker, predictive of graft and patient survival.) This was despite a 54% increase in the mean duration over which the NMP livers were preserved - and a 50% lower rate of organ discard – meaning 20% more livers were transplanted.

With increasing rates of liver disease, the current supply of transplantable organs is no longer able to meet demand, exacerbated by 37% of UK deceased donor livers being discarded. Professor Coussios says, "This study describes the formal clinical evaluation of a novel technology in liver transplantation, and could herald the start of a new era of intervention during organ preservation".

To read the full paper see https://www.nature.com/articles/s41586-018-0047-9

Listen to an interview with Professor Coussios about the technique and study https://www.mixcloud.com/oxideradio_live/steming-from-oxford-ep2-de-livering-the-goods/

"This study could herald the start of a new era of intervention during organ preservation."
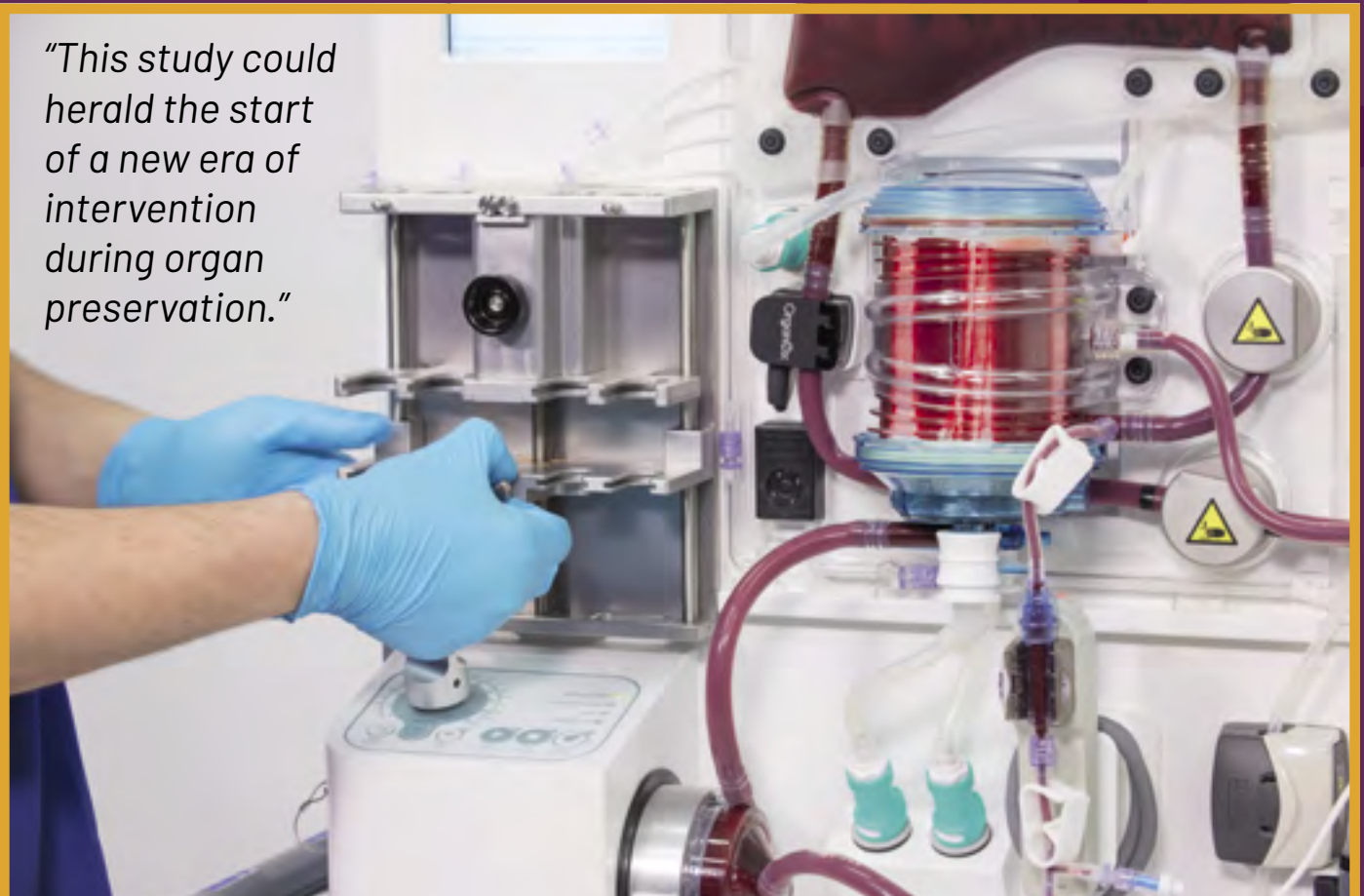
Oxford Robotics Institute (ORI)

2018 was a year of spectacular growth in the ORI. We now number seven academics and nearly 80 members. Our robotics interests span from the ocean, through fusion reactor inspection, quadrupeds, drones, artificial skin, home robotics, manipulation, long-term planning and super-human machine perception. It feels busy.

We are massively fortunate to have integrated premises in which to run the 6 labs of ORI - in the newly refreshed George Building at 23 Banbury Road, opposite the Thom building. Moreover, we will be moving in 2019 into a fabulous new and connected experimental space in the newly-constructed Keble College H.B. Allen Centre. Here we will house all of our equipment from the walking machines, the driverless cars and a farm of 'arms' soon to be skinned (sounds more macabre than it is!).

Academically we have also had a great year. We published just over one paper every week, raised over £3M in research income, forged five new industrial partnerships, and began two major Industrial Strategy Funded research programmes.

Our mission continues to be to "demonstrate solutions for the hard problems that stand between us and the large-scale ubiquitous deployment of robots". This takes us not only in thrilling research directions but also to remarkable places. Indeed, 2018 saw an ORI team take a vehicle up a volcano in Iceland. We were seeking the worst weather conditions in Europe but instead found the clearest skies in 60 years. A metaphor for what is to come perhaps.

Oxford e-Research Centre

Oxford e-Research Centre's expertise in digital research methods has enabled the Centre to continue its work across traditional academic disciplinary boundaries bringing together significant research capabilities from across the University.

August 2017 marked the beginning of the Centre's integration into Engineering Science. Over the last year we have continued to build on this with our academics now teaching undergraduate courses, supervising graduate students and sitting on various panels and committees within the Department.

In May 2018 we launched a new Coursework Module in Scientific and High Performance Computing and a new MSc in Energy Systems will accept its first students in 2019.

The Centre has been awarded new grants from EPSRC, STFC, NIH, EU/H2020 and Wellcome Trust. We co-lead JADE, a £3 million supercomputer that is the UK's national resource for machine learning and artificial intelligence applications.

This year saw progression of several software platforms, including developing open source ISA tools which now power Nature's data journal "Scientific Data". The Music Encoding and Linked Data software platform has launched as an innovative model for combining multimedia resources.

Throughout 2018, the Centre has continued its industrial engagement with many companies: from Abbey Road Studios and British Gas to NVIDIA and ARM, collaborated widely with many prestigious institutions and has continued to partner with departments across the University of Oxford.

The Centre has also been involved in many high profile research projects, publications, keynotes and presentations. Oxford's role in the national 'Internet of Things' (IoT) research hub has led to the chairing of a major public event, the "Living in the Internet of Things" conference, and the launch of an IoT journal. Successful research on anomaly detection has led to several patent applications on the methods developed.

In July 2018, the Centre hosted its most successful Digital Humanities at Oxford Summer School, with over 220 attendees from around the world.

Oxford-Man Institute of Quantitative Finance (OMI)

This year has seen AI and machine learning even more prominent in the media. Our keen focus on principled AI and machine learning within the OMI means that we can follow these advances, develop and innovate new ones and work to make them deployable. Our ability to produce world-leading science requires a commitment to bring talent into the OMI.

We are delighted to have appointed not only three new faculty (two senior researchers and a departmental lecturer), but also to welcome four postdoctoral researchers into the institute, to host ten interns and to welcome twelve new graduate students to work on various aspects of machine learning in finance.

We have worked over the year to develop in-house hardware and software to accelerate our research. Most notably, our IT team have created a rapid development infrastructure, co-located with our data servers. Allied with hardware capability, we have spent time creating new software to distil the data feeds that come into the OMI, creating a data lake of derived measures essential for research. This last summer we pioneered the development of a trade simulator. This enables us to test, for the first time, the effectiveness of algorithmic trading strategies in a digital twin of a live financial market. Further, it allows different algorithms to compete in the marketplace, paving the way to realistic multi-agent simulations.

This year has seen links throughout the University strengthen, welcoming new members from Engineering Science, the Saïd Business School and the Computer Science and Economics Departments. Our members have published broadly, from producing innovative work at the heart of finance to novel algorithms for machine learning on quantum computers. OMI members have delivered keynote seminars and taken part in policy workshops at the heart of government and the finance industry. Our internal termly workshops have continued to be very well supported, building outreach and collaboration across the University.

Oxford Thermofluids Institute (OTI)

The Oxford Thermofluids Institute is a world leader in the fields of turbomachinery, energy, microfluidics and hypersonic flow research, with current grants exceeding £35 million. We are very proud of our long-term partnerships with Rolls-Royce, the EPSRC, the Aerospace Technology Institute, Mitsubishi Heavy Industries and Siemens, which enable us to deliver impactful research.

Over the last year, the Institute has continued to grow, with four new faculty members and double the number of staff and students relative to when we opened the laboratory in 2010. Our students and researchers continue to win prizes. For example, DPhil student Alexander Bucknell won a prestigious student paper award from the American Institute for Aeronautics and Aerospace (AIAA) for his work on ice crystals forming on jet engines at altitude, in collaboration with Rolls-Royce.

A testament to our success in attracting the best staff and students is the trajectory of PhD student and Rhodes Scholar Gladys Ngetich who was identified as a Rare Rising Star 2018 and also won an ASME IGTI Young Engineer Turbo Expo Participation Award. The Rare Rising Stars programme is designed to recognise and celebrate the achievements of the best black students in the UK.

Europe's fastest hypersonic wind tunnel, our T6 Stalker Tunnel, is now operational and capable of producing test flows in excess of 20km per second. The facility, developed in collaboration with the University of Queensland, is unique in allowing hypervelocity ground testing not previously possible in any other European facilities. The tunnel, developed by Professor Matt McGilvray, will be used to research the aerothermal challenges of cooling space ships as they re-enter the earth's atmosphere.

This year, IotaSciences, one of our five company spinouts since 2012, won the highly competitive New Product Award at the Society for Laboratory and Automation Screening conference in the USA. The award was for a portable benchtop single-cell instrument, invented by Professor Ed Walsh and his team, which creates microscopic liquid chambers and deposits single cells into them. The technology promises to have a range of medical applications including genome editing and the establishment of novel cellular disease models.

In September, we held an EPSRC-funded Art and Science outreach event in partnership with Imperial, Birmingham and Southampton universities and with local artists. The event engaged Year 10 -11 art students in the latest developments in hypersonic flight and future jet engines.

The T6 Stalker Tunnel at Oxford Thermofluids Institute

Institute of Biomedical Engineering (IBME)

The IBME, based on the Old Road medical campus in Oxford, offers a world-class venue for biomedical engineering research and postgraduate research training where engineers and clinicians work together on diagnosis and treatment of major diseases and conditions. Some of the IBME's highlights for 2018 include:

Our ongoing work on normothermic machine perfusion was featured on the front cover of Nature when the journal reported on the first randomized trial to compare conventional cold storage to warm machine perfusion in organ transplantation (see page 7).

IBME and other Oxford researchers made a breakthrough in more precisely targeting drugs to cancers, published in Lancet Oncology. A multi-disciplinary team of biomedical engineers, oncologists and radiologists demonstrated for the first time in patients the safety and feasibility of remotely triggering, localizing and enhancing drug delivery to liver tumours, by using extracorporeal ultrasound and lipid drug carriers (liposomes).

The Rosalind Franklin Institute, a National Centre of Excellence, was set up this year to tackle many of the key challenges in the health and life sciences. The recently appointed Chair of Biomaterials, Professor Eleanor Stride, will lead one of the initial projects, creating the world's most advanced ultra-fast video camera. The camera will help researchers develop techniques using sound and light to detect and treat diseases including some of the most fatal forms of cancer.

Our students continue to win prestigious prizes and awards. IBME doctoral student Glen Wright Colopy (along with Departmental junior research fellow Dr. Tingting Zhu) was recognised for work identifying patient-specific trajectories in haemodialysis, at the IEEE Biomedical & Health Informatics Conference (BHI) in March in Las Vegas.

Postgraduate student Bo Zhang was one of 17 recipients of the coveted Canadian Centenial Scholarship, which recognises academic excellence. Undergraduate student Sagar Vaze won the Qualcomm-sponsored prize at leading medical imaging conference MICCAI for Best Biomedical Engineering 4th Year Project. Sagar is developing efficient machine learning algorithms to analyse images on mobile devices, allowing automated ultrasound analysis in remote locations.

We are delighted to be taking part in Oxford's first overseas research centre for physical sciences and engineering, the newly-opened Oxford-Suzhou Centre for Advanced Research in China. Professor Zhanfeng Cui and Professor Cathy Ye (regenerative medical technologies) and Professor David Clifton (smart healthcare technologies) are among the 12 Oxford Academics who will lead initial research at the Centre.

Heloise Greeff, UNICEF-funded Engineering Science DPhil student, collecting data using Smart Handpump technology in Kenya. Smart Handpumps use an accelerometer, microprocessor and inexpensive GSM transmitter to enable remote monitoring of infrastructure health status (condition monitoring). Researchers have been using machine learning techniques to develop new applications for Smart Handpumps, including the ability to monitor groundwater level. Image by Farah Colchester. See page 11 for more about the Smart Handpumps project.

Success at Vice-Chancellor's Innovation Awards

The University's VC Innovation Awards celebrate the quality and breadth of research-led innovation across the University. In 2018 they received 78 entries, from which four winners were selected and a further thirteen projects Highly Commended across all four categories – Team Work, Building Capacity, Inspiring Leadership, and Early Career Success.

The Smart Handpumps project was both the overall winner of the VC Innovation Awards, and winner of the Building Capacity category. In addition, the judges' list of Highly Commended Entries included three initiatives from the Department of Engineering Science: in the Inspiring Leadership category, 'Where am I? Large Scale Infrastructure-Free Navigation for All the Vehicles,' (Professor Paul Newman); and in the Teamwork category, 'GDm-health™: real-time management of gestational diabetes', and 'Building Strategic Partnerships in Digital Health,' (both Professor Lionel Tarassenko).

Smart Handpumps, overall winner

Professor David Clifton, Dr Achut Manandhar, Heloise Greeff and Farah Colchester were amongst the team-members given the award for developing Smart Handpumps, an innovative technological and institutional response to the need for clean drinking water in Africa and Asia. The project is a collaboration with Professor Rob Hope's research team in the School of Geography and the Environment.

Estimates indicate that around 844 million people globally are without access to safe drinking water. Many of them live in rural areas and rely on groundwater (one of the safer drinkable forms of water), lifted to the surface using handpumps. The team's innovation involves installing a novel transmitter in water pump handles, which automatically sends data to alert local maintenance providers. This has reduced the time to repair handpumps from a month or more to one day. The research has led to a change in the Kenyan Water Act, the incubation of two social enterprises, and a legally-registered trust fund blending user, private and public finance.

The research has to date received over £3 million in competitive research grants from Research Councils, Government Departments and University Funds. It has created an opportunity for two different departments to come together, collaborating on research and making use of one another's skills.

Professor Clifton says, "It is a great honour for the Geography-Engineering team to be recognised in this way, which is the culmination of over five years of close working between the two labs, supported by substantial investment of research funding from UK government and the University. Both Departments are among the best in the world in their respective fields and, speaking on behalf of the engineers in this project, we're delighted to see tangible impacts being made at scale that show the strength of collaborative research at Oxford".

See a film about the project at http://www.ox.ac.uk/research/vice-chancellors-innovation-awards

Department spinout is 150th for University

The Department's augmented and virtual reality spinout 6D.ai (then called 6Degrees) was announced as the University's 150th spinout in November 2017, as Oxford University Innovation celebrated its 30th birthday. Around 40 spinouts have their origins in Department of Engineering Science research.

6D.ai: from Oxfordshire to Silicon Valley

6Degrees was re-named 6D.ai in 2018. Its flagship product uses a standard built-in smartphone camera to construct a three-dimensional map of the world, all in real-time. This runs in the background of other developers' Augmented Reality (AR)-enabled apps.

For the first time, it provides them with the ability to both remember a user's previous spaces, and to crowd-source a 3D map of the world from footage supplied by multiple users, sharing information between them to make the map ever more accurate and immersive.

This means that multi-player games can be played across various devices, all taking place in the same physical space. Digital effects can actually interact with the 3D world around us: instead of just placing an animation on top of the camera input, you can watch (for example) a digital mouse scurrying around your own real-life furniture or throw a virtual ball into the actual bowl sitting on your coffee table.

For Professor Victor Prisacariu, Dyson Associate Professor in Information Engineering and co-founder of 6D.ai, this is only the start of what AR can accomplish. "Over the next few years," he predicts, "AR will continue to gradually solve the key challenges standing in its way and will find success in various industries".

This cutting-edge research originated in Oxford, but when it came to launching the company, Professor Prisacariu and his colleagues looked slightly further afield. "We chose to base ourselves in San Francisco because we have ambitions to become a major AR platform," he explains.

"Being based close to Apple and Google, the leading AR platforms, and the technical and executive talent nearby meant that we have the best chance of success. In addition, the large investment community meant that we could obtain support from, rather than compete with, the Silicon Valley eco-system."

Outreach

The Department undertakes outreach activities each year to help encourage secondary school students to study engineering. Our Access and Alumni officer (funded by an alumnus from the Department) maintains active external links with schools, colleges and industry; organises summer schools, events and presentations for school students and teachers; and creates activities that will inspire an interest in engineering. Here are some of the outreach events that have taken place this year:

Sixth-formers get a Headstart in engineering

In July, for the 8th year running, the Department hosted sixth-form students from schools across the UK as part of Headstart, a well-established residential outreach summer school delivered by universities on behalf of the Engineering Development Trust (EDT). The programme gives participants a taster of the engineering course and university life, through practical problem-solving tasks, team projects, lectures, industrial site visits and a variety of evening activities.

At the start of the week, the 38 students experienced a university-style lecture on mathematical modelling, which successfully stretched them past their school syllabus and introduced them to a new style of learning. During the course of the week, they then worked on a short problem sheet, which they had a chance to discuss and work through with an academic in small group tutorials at the end of the week.

The students also worked on three different laboratory projects including bridge-building, robotics and Computer Aided Design, which involved designing a keyring using SolidWorks and printing it using a 3D printer. The sixth-formers also got a chance to see engineering in practice, with site visits to Thames Water Sewage Treatment Site and the Keble College H.B. Allen Centre construction site.

The UNIQ one week residential for state school pupils is designed to excite students about engineering and give them a taster for Oxford.

Lubbock Lecture schools event

School students in years 10-12 were given the opportunity to talk to Professor Timothy Leighton, FRS FREng, from the University of Southampton, about his research on Bubble Acoustics in a special Q&A session arranged by the Department as part of the 44th Maurice Lubbock Memorial lecture event.

During their visit, the pupils also got the chance to interview 4th year undergraduates on their project presentations and heard from others about what inspired them to study engineering. 1st year undergraduate Holly told them about Ocean Cleanup, an engineering-led project to rid the world's oceans of plastic pollution. She said she wanted to show the breadth of engineering, something which might not otherwise occur to school students, and how engineering can be applied to real-world problems facing their generation.

4th year student Andrew talked about the opportunities for engineers to help develop aircraft and spacecraft, and demonstrated how a 3D printed aircraft model was used in wind tunnels to test performance of its shape and design.

15-year-old Elinor, visiting from a London state school, said that the event was useful in seeing what actually goes on in an engineering degree course and understanding the variety of subjects that can be studied.

Matthew Greenwood Award for exemplary outreach by a student

This year's Matthew Greenwood Award was presented to Stanley Speel, a 4th year Hertford College undergraduate student who consistently went above and beyond as a Student Ambassador for Engineering Science at Oxford.

Stanley took part in the Headstart Summer School programme this year for sixth-form students from schools across the UK. One of the sixth-formers commented, "The Student Ambassadors were amazing in every aspect, from helping us settle in on the very first day, to providing us with tips about university life".

Professor Lionel Tarassenko, Head of Department, presented the award to Stanley during the Alumni weekend. He said, "It is our student ambassadors who will inspire the next generation of engineers. They are the ones who can relate to young people and inspire them as to why engineering is such a fascinating subject. Stanley's efforts in this field have been outstanding, and we look forward to seeing what he goes on to do next."

Equality and Diversity in Engineering

We aim to provide a supportive and inspiring environment for people to work and study at the Department with a number of initiatives to value and support our diverse workforce and promote equality.

The Department of Engineering Science was awarded a bronze award from Athena SWAN in December 2017 for the fifth year running. This award recognises the Department's commitment to the Athena SWAN goal of advancing women's careers in STEMM subjects (Science, Technology, Engineering, Maths and Medicine). The University is also a corporate member of WISE – an organisation helping to promote female talent in Science, Technology, Engineering and Mathematics (STEM).

Our Women in Engineering (WiE) network was established in the Department in 2012. Membership of this group consists of postdoctoral research assistants, postgraduate students, undergraduate students and other academic staff. Over the past 6 years, it has evolved into a dynamic, supportive community of women engineers across many disciplines and career stages.

On 1st May 2018, we held our very first Women in Engineering Symposium at the Department, with over 60 attendees including undergraduates, postgraduates and research staff. The Symposium heard inspiring talks from the Head of Diversity & Equality (MPLS) Helen Byrne, Dr Fatumina Abukar (UCL), Rachel Gittens (Arup) and Dr Barnali Ghosh (Mott MacDonald), followed by poster presentations by DPhil students and research staff and a networking session over drinks and dinner at Trinity College.

In June, a networking lunch was held in the Thom Building to celebrate International Women in Engineering Day (INWED), with profiles of some of our current female staff and students displayed as posters and a short talk by former Civil Engineering research assistant Christelle Abadie.

Apprenticeship Award

The Department's Mechanical Technician Apprentice Lewis Burke was awarded Best Apprentice aged 16-18 at the High Sheriff of Oxfordshire Young Engineer Awards 2018.

The annual award ceremony, now in its 9th year, aims to inspire and recognise the next generation of creative thinkers and problem solvers in Oxfordshire, encouraging them to consider a career in engineering.

Lewis joined the Department of Engineering Science in September 2017 after completing his GCSEs at St Birinus School in Didcot. As part of his apprenticeship, he has been attending training courses in Aylesbury, studying mechanics standards level 2, and has completed training in hand fitting, basic turning and basic milling.

The University is committed to providing exciting and life-changing apprenticeships, where apprentices of all ages train alongside experienced staff, developing their professional skills whilst growing the university's workforce talent. The Department has supported apprentices through Business Administration, IT, Mechanical Engineering and Maintenance qualifications.

Going all out: Engineering Science student wins accolades for sport and study

A Salters' Graduate Award is just the latest achievement for MEng alumnus Sam Collier, whose time at Oxford also saw him cox the rowing team to victory in the 2017 Oxford–Cambridge Boat Race.

Studying for his MEng in the Department was in itself a significant undertaking, but Sam put in the hours on the river, too. In fact, he says, the hours spent practising proved beneficial when entering his final year: "I definitely wouldn't have done as well, had I not rowed in my previous years," he says. "I didn't do any coxing in my final year, but my previous experiences with Oxford University Boat Club (OUBC) have taught me so much about time and project management, as well as how I learn most efficiently. It felt like I just had loads of time to enjoy Oxford – and to catch up on that sacrificed social life!"

At Easter, Sam's hard work was recognised when he received a Graduate Award from chemistry organisation The Salters' Institute. These awards recognise candidates who are smart, entrepreneurial, able to communicate and collaborate, and who have the potential to occupy leading positions in public life and in the UK chemical industries.

Sam, who specialised in Energy Engineering in his final year, supervised by Professor René Bañares Alcántara, says: "The prize is £1,000, but more significantly, access to the networking events that Salters' puts on, as well as the honour of being recognised by a major chemistry

institute. I am extremely happy to have been awarded it, and I have my supervisors to thank for suggesting I apply".

As for balancing the demands of the Engineering Science course and his sporting commitments, Sam says: "Balancing the course with OUBC was definitely challenging. Both demand an awful lot of your time and the art of succeeding lies in finding ways to compromise that still allow you to do really well at both".

"To be honest, in my case that often meant that a real understanding of the material only came in Trinity term, and my social life often suffered. As such, the support of my tutors and friends at New College, as well as other engineers in the Boat Club, was invaluable."

Sam is now taking a well-earned break before pursuing his engineering career: "I'm planning to spend a year travelling and learning some coding and data science".

Our Award-winning students

- DPhil student **Thaís Roque** has won the University of Oxford Vice Chancellor's Diversity Award (Student category) for her work championing and fundraising for refugee students in the University. Thaís launched the Oxford Students Refugee Campaign in 2016 in an attempt to turn the city into a safe haven for students fleeing conflict-torn societies. The campaign has since won pledges of more than £240,000 from almost half the student body to provide scholarships to people whose studies have been disrupted by war or persecution.

- **Alexander Bucknell**, a DPhil candidate based in the Oxford Thermofluids Institute, earned a Student Paper Award from the American Institute for Aeronautics and Aerospace (AIAA) for his work on ice crystals, which form on jet engines while at altitude and can represent a threat to aircraft in flight. Alex received the

award for 'originality, technical quality, organization, literature review, accuracy, and importance to the field' after presenting his paper at a conference hosted by the AIAA.

- DPhil candidate **Gladys Ngetich**, also from the Oxford Thermofluids Institute, was selected for the Rare Rising Stars Awards 2018, which showcases the achievements of the UK's black students. The Rare Rising Stars panel placed Gladys in the top three in recognition of her achievements in sport and social entrepreneurship, undertaken alongside her research. As well as advancing the future of aeroplane engines and tutoring undergraduates, Gladys found time to earn an Oxford Blue in athletics in the 400m hurdles, and to co-found an organisation dedicated to inspiring, mentoring and empowering girls from rural parts of Kenya.

Final Year Project Presentation Prizes

Each year at the Maurice Lubbock Memorial Lecture since 2001, 4th year Engineering Science undergraduate students have presented their final year projects to Alumni and visitors.

Their posters are judged by Alumni representatives now working in industry, with prizes going to winners in 8 categories, and an overall winner is chosen by the Oxford Engineering Alumni (OEA) group.

This year the industry judging panel comprised Alumni Chris Needham, Product Manager for Advanced Analytics at Shell, Alexander Brant, Sub-System Design Integrator at Rolls-Royce, and Dr Victoria Sanchez Zini, Licensing & Ventures Manager, Oxford University Innovation.

The category winners with Professor Tarassenko and Professor Timothy Leighton (University of Southampton), who gave the Lubbock Lecture on Bubble Acoustics.

Category winners

(BIOMEDICAL) GSK: The GlaxoSmithKline prize for best biomedical engineering exhibit. Winner and **Overall Winner**, see page 19: **Ana Roomans Ledo**
Project title: *Automated Quantification of OCT Images for Assessing Stargardt Disease*

(THERMOFLUIDS) Rolls-Royce: The Rolls-Royce prize for best thermo-fluids and turbo-machinery exhibit
Winner: **Andrew Hyslop**
Project title: *Free Flight of the Reaction Engine Skylon Configuration*

(CIVIL) Osborne: The Osborne prize for best civil engineering exhibit
Winner: **Mary Hintze**
Project title: *3D Finite Element Analysis of Submarine Pipelines*

(MECHANICAL) IBEX: Industrial Brushes - The IBEX Industrial Brushes prize for best mechanical engineering exhibit
Winner: **Helen Bridgman**
Project title: *Smart Mouthguard*

(ELECTRICAL) Sony: The Sony prize for best electrical and electronic engineering exhibit
Winner: **Matthew Woolley**
Project title: *Adaptive Laser Fabrication of Novel Optical Fibre Sensors*

(INFORMATION) Ecrin Investments: The Ecrin Investments prize for best information and control engineering exhibit
Winner: **Edward Hall**
Project title: *Modelling and Error Correction for Racetrack Memory*

(CHEMICAL) BP: The BP prize for best chemical and process engineering exhibit
Winner: **James Hendrik Lunshof**
Project title: *Continuous Polyhydroxyalkanoate Production within Ralstonia Eutropha by Short Chain Fatty Acids*

(ENERGY) Jaguar Land Rover: The Jaguar Land Rover prize for best electrical and electronic engineering exhibit
Winner: **Sam Collier**
Project title: *Quantifying and Classifying the Need for Energy Storage*

Helen Bridgman also won the Communications prize for outstanding communications skills.

- EPSRC Doctoral Prize Fellow and DPhil graduate **Matthew Ryder**, from Professor Jin-Chong Tan's research group, was awarded the prestigious Clifford G. Shull Fellowship at Oak Ridge National Laboratory (ORNL) this year. ORNL is the largest US Department of Energy (DOE) laboratory, a world-leading neutron science and nuclear energy research facility, and home to some of the world's top supercomputers.

- **Oxford iGEM team win GOLD again!** The 2018 Undergraduate team, including two Engineering Science students, were awarded a Gold medal and the award for Best Therapeutics Project in the iGEM (International Genetically Engineered Machine) competition. The Oxford team worked on miBiome, a project to develop a novel treatment for Inflammatory Bowel Disease.

Gladys Ngetich collects her Rare Rising Star Award

Jenkin Lecture

This year, the Jenkin Lecture was delivered by Professor Byron Byrne (St Catherine's College), Ørsted / Royal Academy of Engineering Research Chair in Advanced Geotechnical Design.

His talk, *Engineering Design for Offshore Wind*, focused on offshore wind energy, which is becoming a major component of the UK's energy mix, providing nearly a tenth of the UK's electricity, but with a pipeline of sites already under construction or in planning, which will triple supply capability.

Offshore wind turbine design requires a truly multi-disciplinary endeavour, Professor Byrne explained, enlisting the Department's expertise in theoretical modelling, computational analysis, lab testing and field testing among others. The main issue is how to anchor the structures to the seabed and make them resilient to the considerable forces of wind and wave which, unlike traditional offshore oil and gas structures, are of comparable magnitude to the weight of the turbines.

The Department's team led by Professor Byrne focuses on the geotechnical design

aspects of offshore wind structures, which is, he said, "right at the centre of trying to make these designs more efficient and more economical". Industry collaborations with most of the major wind farm developers in the UK ensure that research is at the cutting edge of developments in this area. A Doctoral Training Centre, in collaboration with Cranfield and Strathclyde Universities, aims to train the next generation of technical wind farm specialists.

Watch Professor Byrne's presentation in full on our YouTube channel https://www.youtube.com/EngineeringScienceatOxford

Other Department News

Professor John O'Connor, former Fellow and Tutor in Engineering Science at St Peter's, has been awarded an Honorary Degree of Doctor of Science from University College Dublin. Professor O'Connor, who taught at St Peter's between 1965 and 2001, is the inventor, along with Professor John Goodfellow, of what is now known as the Oxford Knee, a revolutionary device that has helped bring pain relief to hundreds of thousands of people worldwide.

Engineering alumna **Imogen Cowley** was the overall winner of the 2018 Telegraph STEM Awards for her idea of how to prevent or treat pneumonia in children in developing countries. Imogen's idea is a novel vaccine delivery device, called the SnapVaccine, designed to side-step the need for continuous refrigeration that traditional vaccines require. This "cold chain" is a major obstacle for distribution of vaccines in more remote areas where the necessary
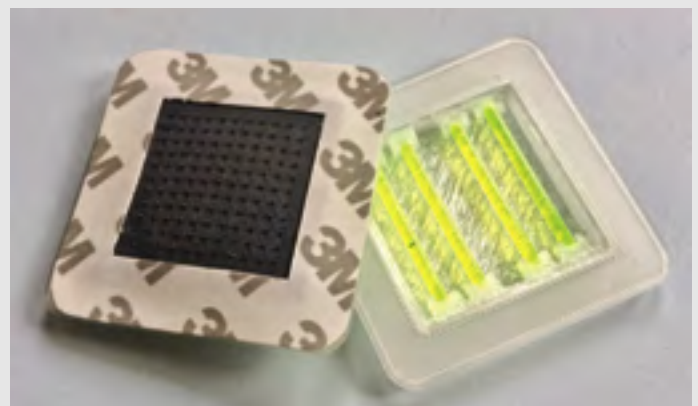
SnapVaccine prototype

transport and energy infrastructure is not in place. Imogen completed her MEng degree in the Department in June 2018.

Alumna Profile

Tamara Finkelstein, Director General for EU Exit Delivery, Department for Environment, Food and Rural Affairs, summarises her career since leaving Oxford:

"I graduated from Oxford (Balliol) in 1989 following three very happy years studying Engineering Science, building great friendships and indulging my interest in politics and leading communities (as deputy president of the JCR and various societies). Following a brief stint in politics as the full time President of SDP Youth and Students in the SDP's dying days, I decided to do a Masters in Economics and my search for funding led me to the Civil Service. It had a scheme which supported me for two years at LSE, summer jobs and then a job as an Assistant Economist at the Treasury. I only planned to stay for a

"I have much for which I should thank the Oxford Engineering Science Department, and my wonderful tutors"

couple of years but more than 25 years later I'm still learning, growing and enjoying what I do.

I have spent so much of my career in the Treasury that I tend to say it runs through me like words in rock. I evolved from roles as an economist in local government spending and business tax into a policy adviser on budgets and spending reviews. I was a private secretary and speechwriter to Gordon Brown in the early days of his time as Chancellor, managed government debt and led the Treasury's own strategy and corporate services and a major review of public service pensions. Outside the Treasury I have worked in a number of government departments with a formative few years as deputy head of the Sure Start Unit leading innovative programmes for young children in deprived areas; ran a change programme to bring customs, immigration and visas into a single Home Office Agency; led on mental health, community, primary and social care at the Department of Health; and most recently set up and led a programme in building safety in the wake of the Grenfell Tower fire. Since April I have been working in the Department of Environment, Food and Rural Affairs leading on EU Exit (there's a lot to do with Brexit in DEFRA). And my career has been supported by my husband and three children while the Civil Service has enabled me to balance work and family life.

When I talk about my career I see my training as an engineer as a great foundation. Studying economics at LSE I took the models I had studied as an engineer and applied them to economic variables and theories, testing my maths to the limits. A civil servant needs to write well, clearly presenting the issues and the evidence. I found that engineering as a discipline was the best preparation to set out the facts, the model, the outcome or recommendation and to test the scenarios and variances.

In all the jobs I've done I have been an advocate of systems thinking - working across silos and looking at end-to-end processes to see answers to issues such as health and social care integration, the experience of very young children in poverty, the impact of poor mental health, and the safety of high-rise buildings. Finally I have a huge respect for the government scientists I have worked with and I suspect my background aids me in accessing their knowledge and skills. So I have much for which I should thank the Oxford Engineering Science Department, and my wonderful tutors at Balliol, Alastair Howatson and Peter Whalley."

Oxford Engineering Alumni (OEA)

OEA includes all Oxford Engineering Science graduates, and present and past members of teaching and research staff of the Department. If this applies to you and the Department has your contact details, you are already a life member.

Our Annual General Meeting

The Annual General Meeting of Oxford Engineering Alumni took place at the Thom building on 15th September, during the Alumni Weekend. Paul Buckley, Secretary of the OEA Committee, reported on the group's activities over the past year, and outlined their plans for this year. Paul (alumnus and former member of staff) says "The committee is always keen to hear from alumni who would like to get involved. They should email alumni@eng.ox.ac.uk".

Members of the OEA Committee (left to right): Professor Lionel Tarassenko, Paul Buckley, David Jeffcoat, Nigel Titley, Lynsey Thomas, John Carter, Douglas Craig, Simon Turner, Vaughan Michell.

2018 "Meeting Minds" Alumni Weekend events

All the presentations are available to watch online on our YouTube channel https://www.youtube.com/EngineeringScienceatOxford

Graduates of the Department of Engineering Science returned to Oxford on 15th September for a day of building tours, demonstrations and the 2018 Jenkin Lecture, with around 100 former students visiting the Thom building over the course of the day.

The building tours were organised by the Department to give alumni a chance to see the range of new laboratories, teaching facilities and equipment housed in the Thom building, as well as get a flavour of recent research activities.

Alumnus John Skeates commented, "I really enjoyed the tour, it was great to see the labs again and [have] excellent discussion and questions. I would definitely continue running the Tours. The afternoon lecture was also very enjoyable."

2020 Vision

Head of Department Professor Lionel Tarassenko presented an update on his '2020 Vision' for the future of Engineering Science at Oxford. He laid out some of the successes of the past year, and outlined where he sees the Department progressing in the future.

Head of the Teaching and Design Support Group Bob Scott explains plans for the 3D printing innovation space and how the printers work, including how the part density can be changed, during an Alumni Weekend building tour

"Thank you for arranging the Alumni Day on Saturday. I was most impressed by the quality of the teaching facilities and found the presentations most interesting. Please pass on my thanks to all who gave up their time to make it such a good day."

Rodney Job, Engineering Science Alumnus

OEA Project Presentation Prize talk

Ana Roomans Ledo, 2018 winner of the OEA prize for the overall Best Project Presentation (see page 15), gave a talk on her project *Automated Quantification of OCT Images for Assessing Stargardt Disease.*

Over 2 million people suffer from sight loss in the UK. Inherited Retinal Diseases such as Stargardt Disease account for 2 out of the 4 leading causes for blindness, but diagnosis of the disease is complex. Clinicians make use of imaging technologies such as Optical Coherence Tomography (OCT) to inform their diagnoses. Quantifying OCT images could aid diagnosis in detecting the presence of Stargardt disease, classifying the scans according to the pathology they present, and assessing the progression of the disease.

Tests on a cohort of 103 healthy subjects and 649 Stargardt sufferers showed very high accuracy when using the machine learning algorithms which Ana developed during her 4th-year project, under the supervision of Professor Jens Rittscher.

New Data Protection Regulations (GDPR)

General Data Protection Regulations (GDPR), in conjunction with the Privacy and Electronic Communications Regulations (PECR), require specific consent by individuals for email communications so we need to ask you to opt-in to receive email from us about news and events in the future. Organisations which do not comply face heavy fines.

We will need to collect (and store) your consent again in order to send you future communications electronically rather than on paper, which is much more cost efficient for the Department and better for the environment.

Please opt-in via this link: www.eng.ox.ac.uk/opt-in - if we do not have email consent from you, we will send you postal mail from now on.
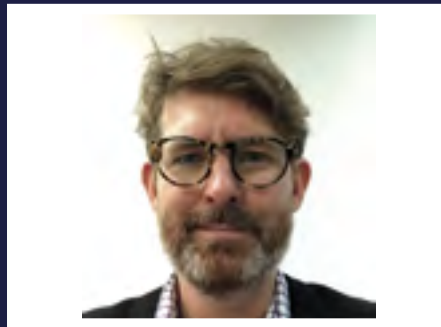
Academic Awards

Dr Brian Sheil

Dr Brian Sheil, Departmental Lecturer in Geotechnical Engineering, has been awarded a Royal Academy of Engineering Research Fellowship which will allow him to devote more time to his project 'Intelligent Real-time Monitoring to Inform Underground Construction Processes'.

The Research Fellowships, which are highly competitive, are designed to advance excellence in engineering by enabling outstanding early-career academics to concentrate on basic research in any field of engineering.

In April **Professor Tim Denison** was announced as one of the ten Royal Academy of Engineering Chairs in Emerging Technologies. The Chairs focus on developing technologies that have the potential to bring significant economic and societal benefits to the UK, ensuring that the UK is a driving force for global technological innovation. Professor Tim Denison was recognised for his work in brain engineering and his development of closed-loop, non-invasive bioelectronic therapies for neurological disorders. Supported by the UK government's National Productivity Investment Fund, the Royal Academy of Engineering has committed £1.3 million to each of the ten-year programmes. The support provided to the Chairs in Emerging Technologies will enable these engineers to focus on advancing the novel technologies.

Professor Tim Denison

Associate Professor Chris MacMinn has been awarded an ERC Starting Grant from the European Research Council for the project "Deformation control on flow and transport in soft porous media". No fewer than five academics in the Civil Engineering group are now funded by prestigious external awards (the others being **Professor Ton van den Bremer** and **Dr Brian Sheil** as Royal Academy of Engineering Research Fellows, **Professor Byron Byrne** as Ørsted / Royal Academy of Engineering Research Chair and **Professor Richard Willden** as EPSRC Research Fellow).

Professor Malcolm McCulloch recently won the GUSI Peace Prize, which recognizes individuals and organizations who have contributed to global peace and progress through a wide variety of fields. He was nominated for the work he does with the Energy and Power sector worldwide.

Post-doctoral Research Assistant Dr Mark McAllister has been named as the recipient of the Osborne Reynolds Day PhD Oral Presentation Competition by the European Research Community on Flow, Turbulence and Combustion. Based in the Department's Environmental Fluid Mechanics Research Group, Mark's research revolves around expanding our understanding of extreme waves in the ocean.

Academic News

Professor Tim Denison took up the post of Professor of Neurotechnology at the University of Oxford in August 2018, based in Engineering Science and the Nuffield Department of Clinical Neurosciences, and will lead the effort in developing novel, closed-loop, minimally invasive brain therapies.

Professor Ton van den Bremer joined as Associate Professor and Royal Academy of Engineering Research Fellow and **Dr Sinan Acikgoz** joined as Associate Professor in Structural Engineering.

The Department has made three new female academic appointments: **Professor Eleanor Stride FREng**, Statutory Chair in Biomaterials, who will lead a new research programme on the medical
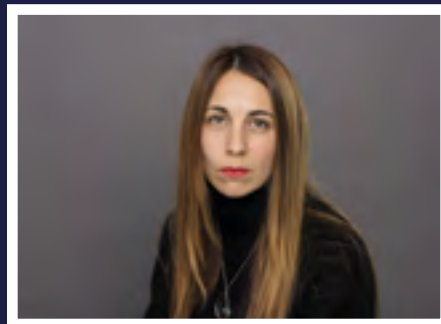
Professor Perla Maiolino

campus on biomaterials and non-invasive therapies; **Associate Professor Perla Maiolino**, Information Engineering, who is joining the Oxford Robotics Institute to create a soft robotics research lab; and

Associate Professor Barbara Rossi, Civil Engineering, who will be leading work on structural testing and the development of design guidance for metallic structures.

Professor David Limebeer, Professor of Control Engineering, is returning to South Africa. Professor Limebeer moved to Oxford in 2009. His research has encompassed a range of applied and theoretical problems in control systems and engineering dynamics, including increasing energy recovery efficiency to reduce lap times in Formula One racing.

Associate Professor Frank Wood (Information Engineering) and **Professor Bhaskar Choubey** (Electrical Engineering) also left the Department this year.