INNOVATION insights

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

ISSUE 15 AUGUST 2020

THE STATISTICS CLUSTER

A new initative showcasing the consultancy capacity at Oxford University

Other articles include:

OXFORD UNIVERSITY INNOVATION

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INNOVATION insights

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INVENTION

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Responding to COVID

Researchers and the Oxford ecosystem aid the UK's fightback

The feature article in this edition of *Innovation Insights* focuses on the Statistics Cluster that Consulting Services has introduced to highlight the resources available within the University, and to make them more accessible. This is one of numerous areas of strength at Oxford, many of which have been at the forefront of new initiatives to address the COVID-19 pandemic.

The story of the vaccine being developed by Professor Sarah Gilbert's team, and the rapid trials to evaluate it, has been widely told. Many other initiatives across every imaginable discipline are also making great progress – from spinout Oxsed's rapid COVID test, developed in China and the UK, to an app from the Life-saving Instructions For Emergencies (LIFE) team that delivers training scenarios on how to respond to the pandemic. DNA-sequencing company Nanopore, another spinout, has agreed to supply the UK government with 450,000 LamPORE tests.

These are just a small sample of the great work being carried out by Oxford University researchers. In due course someone will write a book about Oxford's leading role in the response to COVID-19. OUI assists with many of these projects and, despite the constraints of lockdown, our company creation numbers and consultancy engagements in the year to July were comparable to previous years. The University spinout portfolio also attracted record investment – we'll have more to say about this in our Annual Review.

Please keep in touch – we all have a role in translating innovation from academia to benefit society at large, even while direct contact is not an option.

With best wishes from everyone here at OUI, we hope you stay safe and well.

News

OUI updates and Q2 activity
OUI launched five companies during a COVID-defying quarter, two startups, two spinouts and one social enterprise.

FULL ARTICLE ▶

Smartphone app offers students career planning
Careershe, Singapore-based startup from Oxford University Innovation incubator, has developed an app to provide smartphone-based career advice to Chinese students.

FULL ARTICLE ▶

ORCA Computing raises £2.9M to develop quantum technology
Oxford spinout ORCA Computing has secured private funding to begin building their quantum computers using telecommunications components.

FULL ARTICLE ▶

Oxford vaccine produces strong immune response
Oxford University's Jenner Institute and Oxford Vaccine Group continue to led the way for a vaccine against COVID-19.

FULL ARTICLE ▶

Advanced fluoride-based materials in lithium-ion batteries

Lithium-ion batteries are ubiquitous in the modern technology era. Efficient energy storage batteries are in high demand to address the ever-increasing performance of portable electronics and the need for extended range with electric vehicles.

Recent research showed that using transition metal fluorides as electrode increased the theoretical capacity of lithium-ion batteries, however its implementation proved to be challenging because of chemical stability issues.

Researchers at Oxford have found a new method to increase the stability of transition metal fluorides in lithium-ion batteries, thus opening new possibilities in energy storage research and applications in areas ranging from consumer electronics to electric transportation.

FULL WEB PROFILE ▶

Detecting deterioration in post intensive care patients

In the UK 28% of deaths in patients treated on an Intensive Care Unit (ICU) occur after the patients return to the general ward. These patients often suffer late developing complications after initial successful treatment in the ICU. There is usually a period of deterioration when a patient shows some signs of developing a complication.

Researchers at the University of Oxford have developed a system, called PICRAM (Post Intensive Care Risk Adjusted Monitoring), that watches over the electronic records of patients after discharge from an ICU. It also gathers electronic information about a patient's stay in the ICU. The system combines these pieces of information to estimate the risk that a patient will suffer a complication in the 24-48 hours after they have been discharged from ICU.

FULL WEB PROFILE ▶

Base editing proteins to repair mutations in the haemoglobin gene

Beta thalassaemias are a group of inherited blood disorders caused by mutations in the human beta globin gene (HBB). Certain combinations of mutations in HBB can lead to severe thalassaemia disorders and sickle cell disease which have life threatening consequences.

Researchers at the University of Oxford have developed the use of programmable base editing proteins for gene therapy to cure these disorders. This approach offers a safer and more effective treatment than to bone marrow transplantation and other gene therapies currently in development. The invention would allow the patient's own cells to be harvested, repaired ex vivo with the programmable base editor and then infused as part of an autologous bone marrow transplant.

FULL WEB PROFILE ▶

Detecting the Water Equivalent Path Length in proton CT therapy

Proton therapy has the potential of being a paradigm shifting treatment modality for cancer. This is due to a physical property of heavier charged particles, which can come to a complete stop in a medium depositing most of their energy at the end of their track (Bragg peak).

There is an increasing number of proton therapy facilities, but anatomical and setup uncertainties are currently hampering the effectiveness of therapy. Current approaches to address this issue include using transmission and CT imaging to determine errors, prompt gamma detectors and TOF PET, and methods to directly measure residual ranges. However, this can require complex, expensive, and large detector setups, which are challenging for clinical use.

Researchers at the University of Oxford have developed an alternative and less complex method of inferring the Water Equivalent Path Length (WEPL) map, by analysing the beam characteristics detected by a generalised 2D detector placed beyond the patient.

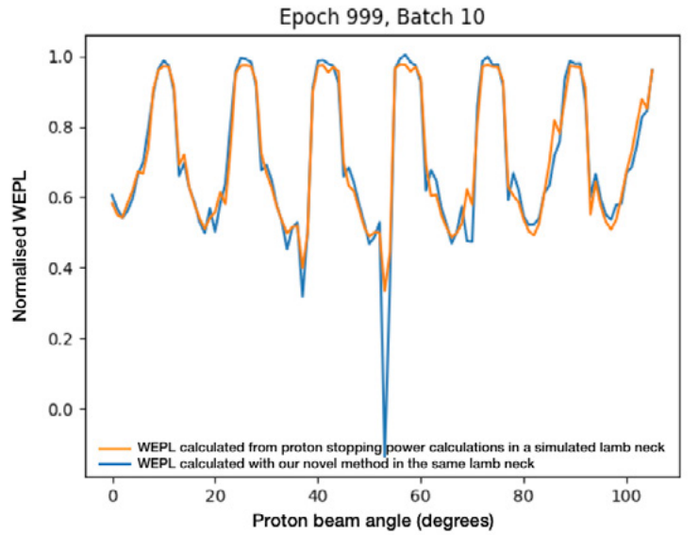


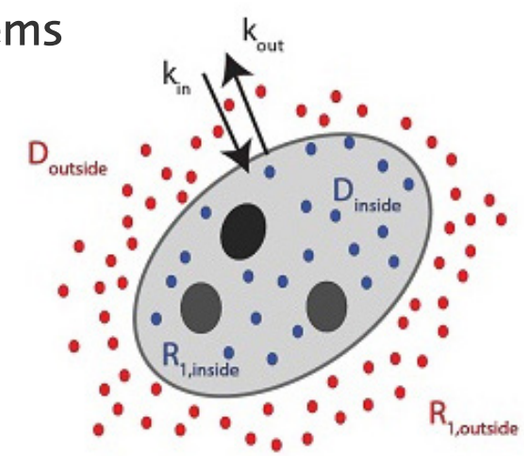
Fig.1: after 1000 iterations the WEPL calculated with our novel method converges to the values of WEPL from conventional proton stopping power calculations obtained from a Monte Carlo simulations of a lamb neck CT.

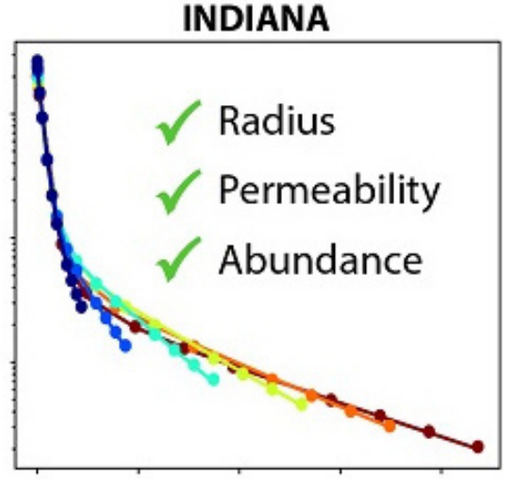
FULL WEB PROFILE ▶

INDIANA - IN-cell DIffusion ANAlysis

Magnetic Resonance is a non-invasive tool for analysing molecules within cells and tissues. Diffusion MRI is particularly popular in medical diagnoses, and in proteomics and cellular studies. Despite the significant progress made in that field, the analysis of data for biological systems is particularly challenging due to the heterogeneity of the samples. A number of tailored models exist for the interpretation of the data in both cell systems and living tissues; however, a general model for cell samples is still lacking.

Researchers at the University of Oxford have developed INDIANA (IN-cell DIffusion ANAlysis), an experimental protocol and software package that offer a quick, accurate and general method for the characterisation of properties in a cell suspension. The practical validity of the method and the accuracy of the parameters have been determined and quantified and the model has been experimentally verified. The method can be applied in the analysis of any spectroscopically resolvable molecule, in cell preservation monitoring and in the field of diffusion MRI.





IN-cell DIffusion ANAlysis

FULL WEB PROFILE ▶

Today Oxford, Tomorrow the World?

Employment laws are often at the top of the list when companies consider building an international presence. The effective management of an overseas workforces is a challenge but is vital to a business's success.

But where to start? Germany, France, or Switzerland? Singapore, China, or South Korea? To help with this conundrum, Oxford Innovation Society member Taylor Vinters LLP has produced updated handbooks for the APAC and European regions which set out an overview on a country by country basis of the key employment/ HR laws covering hiring, managing and retaining people in your chosen jurisdiction.

European employment law handbook ▶

APAC employment law handbook ▶

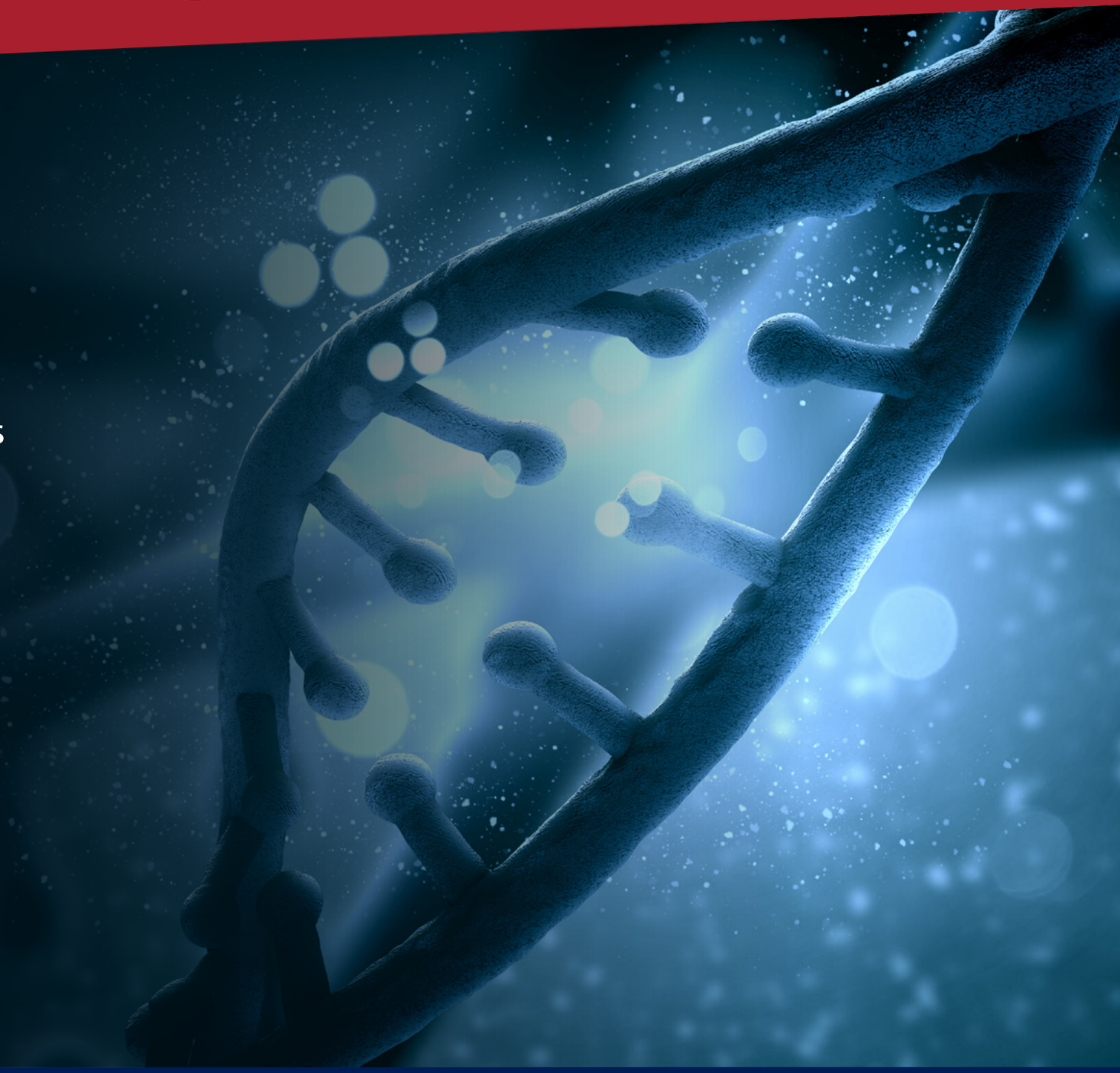
Taylor Vinters

IMPUTE 5

Genome-wide association (GWA) studies involve analysing a genome-wide set of genetic variants to probe the relationship between variants and phenotypes. In general, the variants examined are Single Nucleotide Polymorphisms (SNPs) and the traits are major human diseases.

GWA studies using commercial genotyping chips assay a huge number (> 100,000) of SNPS but these only represent a small percentage of the overall number of known SNPS. Genotyping data must therefore be subject to imputation to identify the untyped disease variants.

IMPUTE 5 is a software program for imputation/estimation of unobserved and missing SNP alleles in a dataset, consisting of genotype data on a set of individuals based upon a panel of known haplotype data and a recombination map.

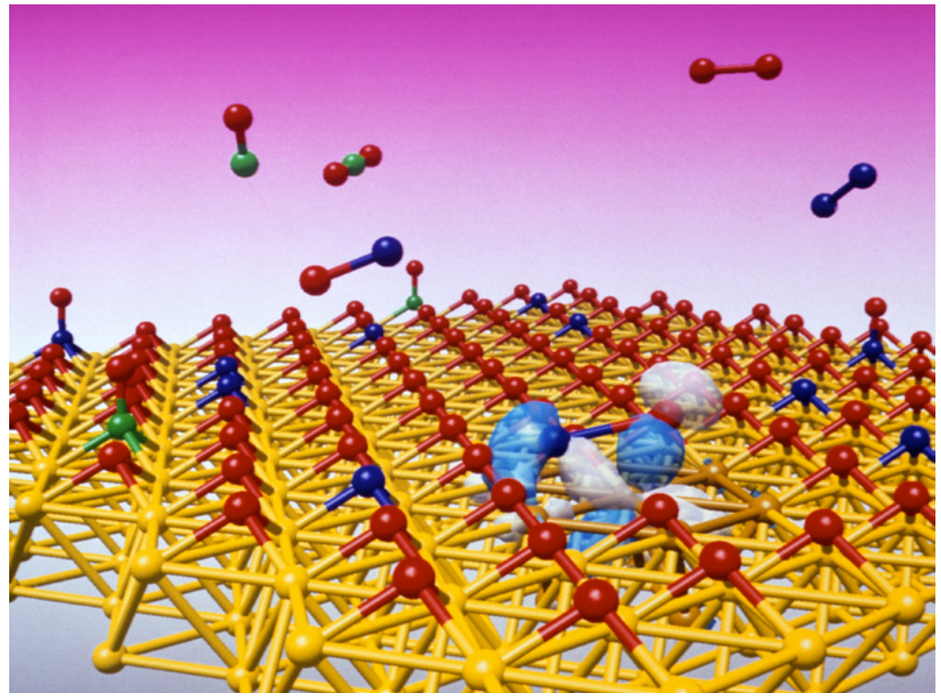


FULL WEB PROFILE ▶

Solar-powered photocatalytic production of hydrogen

Hydrogen, an alternative clean-burning fuel, is of interest to industry and governments given the chronic problems associated with the use of fossil fuels. Whilst huge reservoirs of hydrogen are locked up in water, its extraction requires photocatalytic splitting of water that, even when catalysed by doped catalysts such as nitrogen-doped titanium dioxide, is both costly and inefficient.

To surmount this issue and bring water photolysis onto an industrial scale, Oxford researchers have discovered that irradiation of a nitrogen-doped titanium oxide photocatalyst with visible light at elevated temperatures and pressure compared to conventional methods significantly improves the rate and efficiency of hydrogen evolution. This invention has significant implications for the development of many other green technologies and is not limited to the valuable generation of hydrogen fuel.



FULL WEB PROFILE ▶

Statistical Consultancy from the University of Oxford

OUI's Dawn Gordon, Project Manager from Consulting Services at OUI, introduces the Statistics Cluster, a new initiative showcasing the consultancy capacity available across the University.

The aim of the Statistics Cluster is to assist external clients to access expertise from the University that will help them solve their statistical challenges via consultancy. Here, Dawn interviews Dr Cora Mezger, (pictured) Director of Statistical Consultancy at Oxford University Statistical Consulting (OUSC) within the Department of Statistics, University of Oxford. Dr Mezger and some of her colleagues will be the first to have their consultancy services promoted through this cluster approach.

Could you tell us more about OUSC?

We are a small team of full-time statistical consultants, based within the Department of Statistics at Oxford University. The aim of OUSC is to provide high quality statistics advice and services to both external clients and colleagues from other parts of the University. My role as Director of OUSC involves all aspects of a "consulting project cycle", which means identifying potential clients, liaising with clients to understand their problems and requirements, resource and time constraints, and then to determine and implement statistical strategies that are most appropriate for their specific project and context. Another important aspect is to enable good communication and feedback processes with clients or other stakeholders throughout the collaboration.

CONTINUED ▶

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Being new to Oxford, could you tell us a little about your background and why you chose to move to the University of Oxford?

I am an applied statistician and my background is rather interdisciplinary, which I think is very helpful when working across a range of sectors and having to adjust the statistical methodologies and terminology to my counterparts. Before joining the University of Oxford, I led a team working in the area of Official Statistics in a global research consultancy that targets, in particular, developing countries. As part of that role, as well as during previous engagements with the United Nations and the French National Demographic Research Institute, I had the chance to work with government, business, and scientists from a wide range of disciplines. The new role with OUSC is a fantastic opportunity to bring statistical expertise to a wider range of clients by making use of capabilities both within the OUSC team and the Department more widely.

Can you describe some of the services provided by the OUSC team?

Some examples include: support to the study design, including sample size calculations and analysis plans, support to data collection and management, statistical analysis and testing, and advice on interpretation, communication and visualisation of findings. We are also happy to discuss requests for tailored training in statistical methods or software and can help clients with data quality assessment studies. We are currently involved in several projects in the medical field, but are also interested in engaging with clients from a wide range of sectors. Both I and my colleague Mariagrazia Zottoli have experience in the area of policy evaluation and official statistics, and so opportunities with government or charities are also relevant.

CONTINUED ▶

Do you deal with shorter simpler consultancy requests, as well as larger/complex projects?

We really emphasise the importance of good engagement with potential clients from the very beginning to make sure everyone is on the same page regarding the scope of the statistical services required. These engagements can range from smaller projects of a couple of days to more sizeable projects of many months. The latter may also require bringing together and managing a small team of statisticians to ensure that all relevant capabilities are available. This is, in principle, possible given the excellent capacity available within the Department and the University of Oxford more widely, but would of course depend on the specific requirements.

And what does a typical consultancy request look like? Or are they all very different?

Some clients already have a very clear idea of the statistical inputs they need, while others know the questions they need answering, but may not be able to translate these into statistical concepts. In either case we would have one or several meetings and also go through documentation that can be provided to ensure we understand the background and aims, requirements regarding any particular statistical methods, any resource or time constraints, and which stakeholders we should engage with. Projects tend to be most effective when statisticians are involved from the early stages, so this is something we recommend.

In our experience, many non-statisticians may understandably have difficulties with statistical concepts. Therefore, our priority is to ensure that all advice and analysis is provided clearly and to the point, using minimum statistical jargon, with a clear explanation of the way we intend to tackle a client's request. Additionally, as I mentioned, we always involve the client in all phases of the consultancy project including the design of our intervention which benefits both OUSC and the client and helps to ensure the mutual exchange of knowledge. This ensures that our service is tailored to our client's needs.

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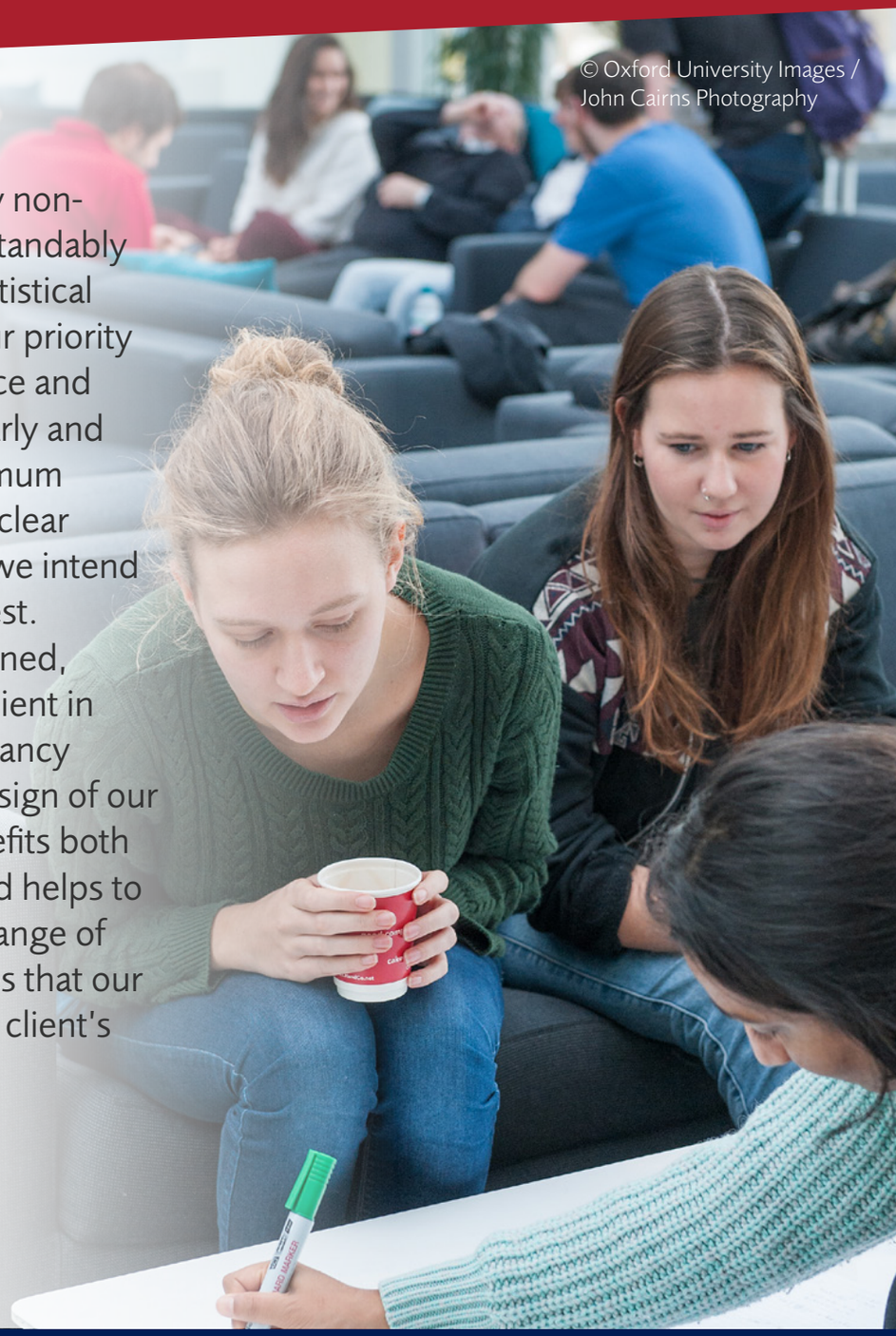

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Could you describe how you and OUSC work together with OUI Consulting Services and what benefits this service & the Cluster provides OUSC?

OUI provide very high quality and efficient support to OUSC as well as to academics engaged in consultancy work, and of course, OUI has a wealth of networks and experience with a wide range of sectors. Knowing that the contractual aspects are all taken care of allows us to focus on the technical aspects of the request. We believe that the Statistics Cluster will give the expertise available at OUSC more visibility, and create more opportunities with potential clients interested in statistical support.

OXFORD UNIVERSITY STATISTICAL CONSULTING

Thank you very much Cora, for sharing more about your work and the OUSC. We're looking forward to working with you to solve existing and new clients' statistical challenges from a broad variety of public and private industry sectors over the coming months and years!

For consultancy enquiries and contractual support please contact Dawn Gordon, dawn.gordon@innovation.ox.ac.uk

FURTHER INFORMATION ▶

A new dataset for autonomous vehicles

While many of the challenges in urban autonomy have been met successfully with lasers and cameras, radar offers the field of robotics a new level of robust sensing.

In 2016, the Oxford Robotics Institute released the "Oxford RobotCar Dataset", one of the largest available datasets for autonomous driving research. This original dataset collected over a year of driving in Oxford, UK, consisted of over 20 terabytes (TB) of data including vehicle-mounted monocular and stereo imagery, 2D and 3D LIDAR, as well as inertial and GPS data.

Since the original dataset was gathered and released, the vehicle software and mechatronics have been maintained and more recently have been configured with a millimetre-wave radar and two additional 3D LIDARs. These additional sensing systems captured the new data included in the new Oxford Radar RobotCar dataset.

FULL WEB PROFILE ▶

A method for genetic modification of biofilms

A methodology developed by researchers at the University of Oxford to modify the DNA of microorganism's in biofilms unlocks the potential to enhance or eradicate biofilms in a huge range of applications.

The addition of DNA into established biofilms removes the need to culture these microorganisms, many of which are unculturable. Biofilms cover a multitude of surfaces and can be both advantageous, for example in bioremediation, or dangerous, for example in medical devices. The ability to modify biofilms holds a wealth of potential across many sectors.

FULL WEB PROFILE ▶

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IMPORTANT NEWS
FOR OUR OIS MEMBERS

Considering the Coronavirus outbreak and the current UK Government advice, Oxford Innovation Society (OIS) meetings are currently on hold.

We are preparing alternative means of engagement and will communicate details to members once arrangements have been made.

Enterprising Oxford
Supporting Entrepreneurial Connectivity

UNIVERSITY OF OXFORD

Interested in the Oxford Entrepreneurial Ecosystem?

Enterprising Oxford is an online guide to entrepreneurship
(opportunities, resources, events, spaces and people)
in the University of Oxford and the local community.

Find out more at:

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