

REPORTER

#310
26 APRIL 2019

SHARING STORIES OF IMPERIAL COLLEGE LONDON'S COMMUNITY



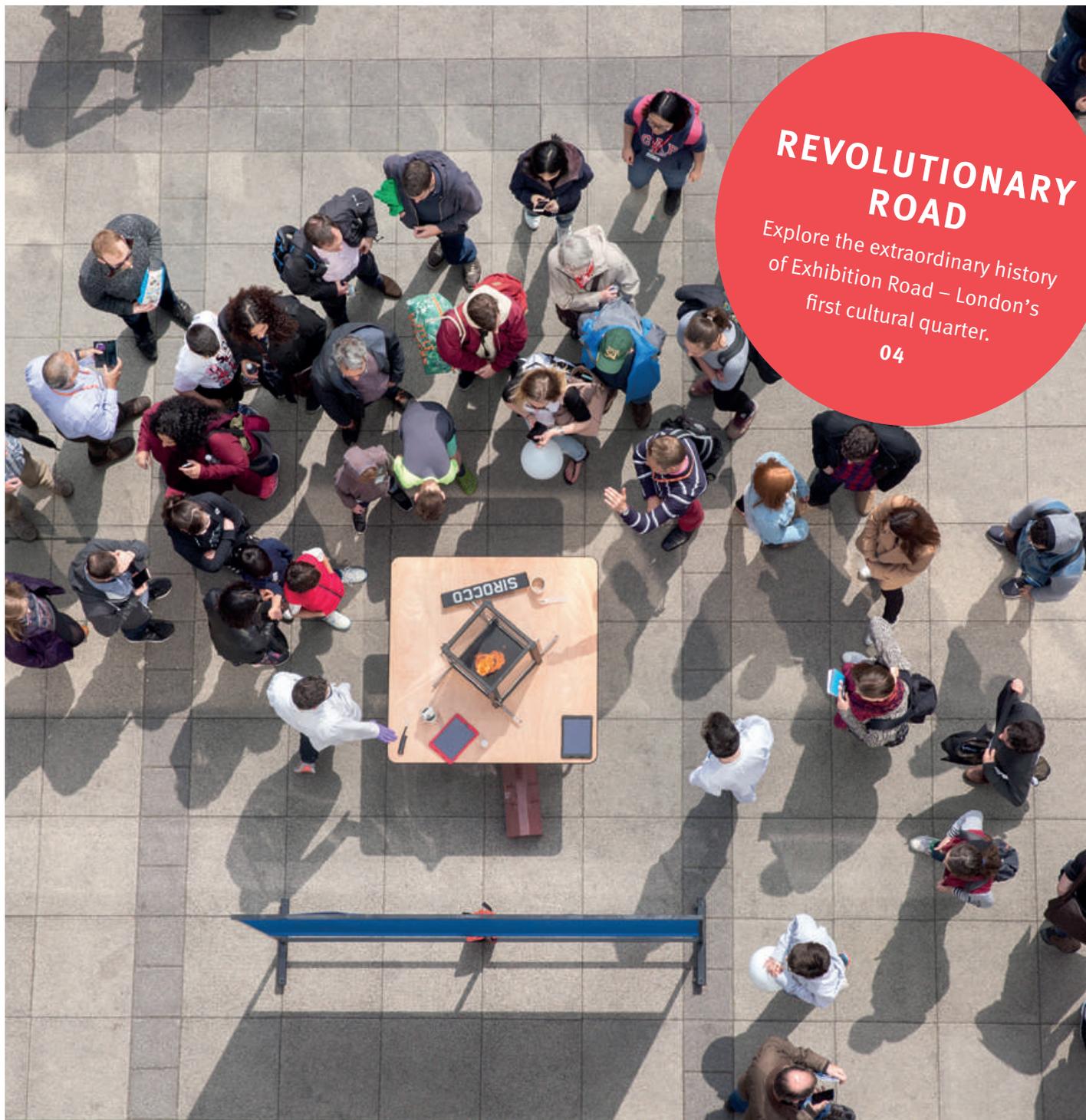
“ IDEAS DON'T HAVE A PASSPORT AND DON'T GO THROUGH CUSTOMS CONTROL

INTERNATIONAL IMPERIAL 10

The partnerships and exchanges taking our community around the world

ENTERPRISE MONTH 18

Showcasing student innovation and entrepreneurship



REVOLUTIONARY ROAD

Explore the extraordinary history of Exhibition Road – London's first cultural quarter.

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Explore the extraordinary history of London's first cultural quarter and the Great Exhibition of 1851



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EDUCATION

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COMMUNITY

Celebrating long service, distinguished honours, and remembering members of our community

Reporter is the voice of the staff community at Imperial College London and we're always keen to share success, both on and off campus. If you've a story you'd like included in a future edition, please contact us.

► **GET IN TOUCH:** reporter@imperial.ac.uk

IMPERIAL IN BRIEF



GLOBAL RESEARCH

Strengthening collaborations in Africa

Imperial and the Massachusetts Institute of Technology (MIT) have announced the winners of the first Africa-focused seed fund to support early stage collaborations with institutions across the continent.

The funding, worth \$100,000 in total, will support exploratory research, small-scale experiments and exchanges between the partner institutions. The first three projects supported by the fund are based at institutions in South Africa and include a collaboration with the University of Cape Town to investigate how tuberculosis (TB) is spread; a study with the University of Pretoria to improve understanding of eco-friendly refrigerants; and research with the University of Witwatersrand to advance knowledge of string theory.

► **FULL STORY:** bit.ly/reporter310-seedfund



I FIRMLY BELIEVE THAT COLLABORATIONS ARE IMPORTANT NOT ONLY ACROSS DISCIPLINES, BUT ALSO ACROSS CULTURES.

President Alice Gast has been appointed as the Chair of the Newton Prize committee.

The annual £1 million prize celebrates pioneering partnerships between the UK and Newton Fund partner countries, and encourages new international collaborations to address some of the world's most pressing challenges.



COLLEGE

NEW VICE-PRESIDENT (ADVANCEMENT)

Michael Murphy, a global fundraiser with almost 30 years of experience, will take up the role of Vice-President (Advancement) this summer. Michael is currently chief development officer at the prestigious National Academies of Sciences, Engineering and Medicine in the US and will succeed current Vice-President Sarah Porter Waterbury, who retires in May.



This year, Imperial College Boat Club celebrates its centenary. Since its first win at the Henley Royal Regatta in 1923, the Club has made an enormous impact on the world of rowing and seen many of its members compete at the World Championships and Olympic Games.

WHITE CITY

PRINCE OF WALES VISITS WHITE CITY

The Prince of Wales toured the laboratories of Polymateria at Imperial’s White City Incubator in March to learn more about their work on developing biodegradable plastics.

Polymateria are developing innovative “biotransformation” technology that can alter the properties of plastic to make it



biodegradable. This would allow discarded plastic products and packaging to break down naturally over time, rather than polluting the environment.

The company aims to set a new standard in compostable and biodegradable plastics. Their products are recyclable and break down only when the product has reached the end of its lifespan.

Speaking about the visit, Niall Dunne, CEO of Polymateria, said: “Our team were delighted to welcome His Royal Highness to our laboratories: we share his view that so many of our biggest environmental challenges can be better tackled by deepening our understanding of nature.”

► **FULL STORY:**
bit.ly/reporter310-polymateria

SOUTH KENSINGTON

ROYAL COMMISSION CELEBRATION

Commissioners from the Royal Commission for the Exhibition of 1851 were welcomed to Imperial in February to thank members for their support of the Dyson School of Design Engineering. Hosted by President Gast and the Faculty of Engineering, the event included a tour of the School’s new home in the Dyson Building and a celebration of the Commission’s £200,000 gift towards the refurbishment of its teaching spaces. Speaking at the event, Professor Peter Childs, Head of the Dyson School of Design Engineering, said: “Imperial is very appreciative of the Commission’s support for the use of the ‘Old Post Office Building’ on Exhibition Road for educational purposes and we are delighted to recognise their contribution towards the refurbishment of the building. This gift was crucial in supporting the School shortly after its inception.”

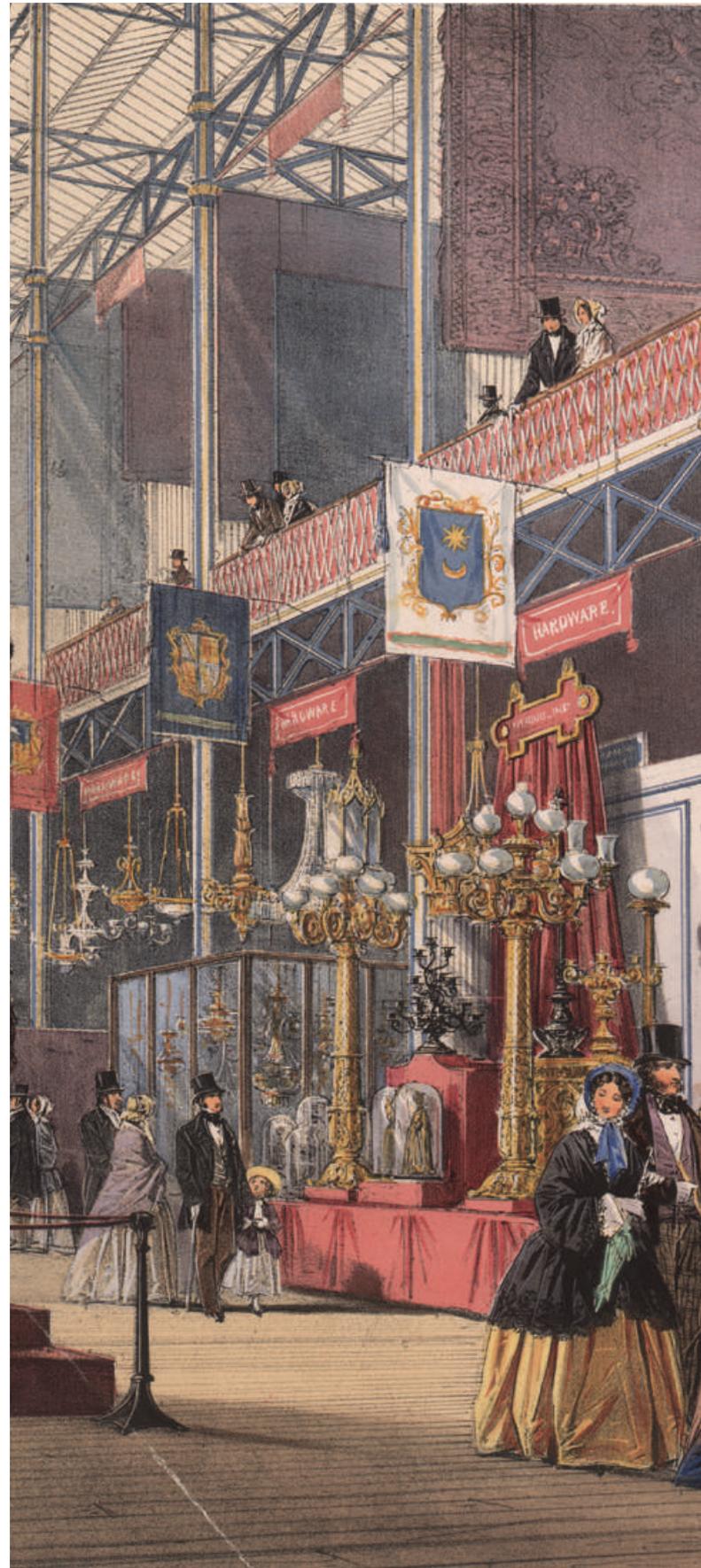
Revolutionary Road

This summer a new festival will celebrate the extraordinary history of Exhibition Road, London's first cultural quarter

OVER SIX MONTHS IN 1851, SIX MILLION PEOPLE FLOCKED to Hyde Park in central London. They had come to see The Great Exhibition of the Works of All Nations — a pioneering display of industry and culture, and one of the defining spectacles of the Victorian age. It was truly something to behold: 100,000 objects from Britain and around the whole world, housed in the Crystal Palace, an iron-framed glass structure three times the size of St Paul's Cathedral that had been built in just four months. Queen Victoria wrote that “every conceivable invention” could be seen there, and she may well have been right: there were locomotives, telegraphs, fire engines, firearms, machines that counted votes, machines that made cigarettes, musical instruments from organs to piccolos and a “penknife” with 75 blades.

The exhibition was the brainchild of Victoria's husband, Prince Albert, a passionate supporter of science and the arts who believed that the two disciplines should interact with one another. “After the extraordinary success of the Great Exhibition, he set his sights on creating something more permanent,” explains Nigel Williams, Secretary of The Royal Commission for the Exhibition of 1851, which seeks to preserve Albert's legacy by providing fellowships and scholarships for research in science, engineering, the built environment and design. “He wanted to create an area where his vision of interdisciplinary collaboration could be realised and passed on to future generations. And so it was that a market garden in South Kensington became ‘Albertopolis’ — the melting pot of museums, universities and galleries that it remains to this day, with Exhibition Road at its heart.”

For one weekend this summer, 200 years after the births of Victoria and Albert, Exhibition Road will be closed off to traffic to make way for a new, free festival celebrating the history of the area while carrying the





TIMELINE OF THE GREAT EXHIBITION OF 1851

- 1840s** As President of the Royal Society of Arts, Prince Albert decided that an international exhibition would be the perfect way to celebrate and promote manufacturing and design.
 - 1850** With the support of Queen Victoria, Albert set up the Royal Commission for the Exhibition of 1851 to organise this enormous undertaking.
 - 1851** The Great Exhibition opened in Hyde Park on 1 May. Realising the enormous success of the venture, Prince Albert wrote a memorandum in August setting out his vision to use the profits from the exhibition to buy an estate. This land would be developed into museums and scientific, artistic and educational institutions. Six million people visited the exhibition, which ran for 141 days and made a profit of £186,000.
 - 1852–3** The estate in South Kensington was purchased and the South Kensington Museum opened in 1852. It was the first of the 'Albertopolis' institutions in this new cultural district.
 - 1855–6** Exhibition Road, Cromwell Road and Queen's Gate were laid out to form the main square of the Commission's estate.
-
- 1857** The South Kensington Museum opened. The Museum was later renamed the V&A, after Queen Victoria and Prince Albert.
 - 1871** The Royal Albert Hall opened. It was named in memory of Prince Albert, ten years after his death in 1861.



spirit of the Great Exhibition into the 21st century. The Great Exhibition Road Festival will see the area transformed, with hundreds of events exploring science, culture and the crossover between them — from talks on the psychology of music to drone workshops, set design sessions and concerts.

The festival is a collaboration between Imperial and other members of the Exhibition Road Cultural Group (ERCG), including the V&A, the Science Museum, the Natural History Museum, the Royal Colleges of Art and Music, the Royal Albert Hall and the Royal Commission for the Exhibition of 1851. It will build on the Imperial Festival, which is now in its eighth year and has given scientists the chance to leave their labs and engage with the public, amassing a team of 1,000 volunteers along the way.

According to Vicky Brightman, Head of Public Engagement at Imperial, the festival partners had wanted to join forces for a while, and Victoria and Albert's bicentenary provided the ideal opportunity. She says the meeting of minds involved in developing the programme has been exciting: "You're getting to work with the experts of other organisations — the keeper of design from the V&A, say — and helping to pull their ideas together."



**ALBERT HAD THIS REALLY
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WITH WHAT WE WOULD
CALL NOW PUBLIC
ENGAGEMENT.**

Like its 19th-century predecessor, the festival aims to reach out to new, diverse audiences. "We wanted to come up with something that would allow people to engage with science and art, and ideally attract people who don't already access these things."

Emily Candler, executive director of the ERCG and Discover South Kensington, agrees: "Albert had this really quite radical idea of putting knowledge generation and creation right there with what we would call now public engagement and bringing arts and science together to drive progress. That legacy is not very well-known, but it couldn't be more relevant for the 21st century." She cites the Imperial Festival's success in firing up visitors, especially younger ones: "What I love about it is that you get to chat to the researchers who are actually doing the experiments that will shape our future. You get their enthusiasm first-hand and it is infectious... My kids love that they're talking to 'real scientists'. And they love that it's for all ages, not just kids, because that makes them feel like they're part of a grown-up world."

As well as breaking down barriers to learning, the new festival will break down barriers between disciplines. Professor Henrik Jeldtoft Jensen, a mathematician at Imperial who has been involved in the Imperial Festival since 2012, will be leading an event that perfectly exemplifies this approach. Maths, Melodies and the Mind will take a musical journey through the brain using mind-mapping at



live performances of chamber music at the Guildhall School of Music. It has always been popular, and Professor Jensen enjoys the proximity to the public that festivals allow: “It’s nice to see people curious about science and asking questions. There is eagerness of understanding and general curiosity about what music is and how it relates to your mind.”

Meanwhile, science and visual art will meet in a collaboration between Imperial and the Royal Society of Sculptors, taking inspiration from the honeycombed structure of wonder material graphene, known as Moiré patterns. Produced when two patterns containing gaps are laid over one another, these have provided the inspiration for a number of recent sculptures, and participants in the workshop will have the chance to make their own with Imperial’s material scientists.



Other highlights will include an immersive installation by the cosmologist Dr Roberto Trotta, simulating the sensations of dark matter. And Dr Petar Kormushev, a lecturer in robotics and computing, will be letting his robots out of the lab, giving visitors the chance to challenge them to a game of chess or air hockey. There will be live music throughout the weekend, including a performance of *Peter and the Wolf* by the Royal Philharmonic Orchestra and a new interpretation of Holst’s *The Planets* (featuring contributions from planetary scientists),

along with a special exhibition at the Goethe-Institut of Victoria and Albert’s love letters.

Many of the events will be food-themed, drawing inspiration from the V&A’s landmark summer exhibition on the subject. Alex Lipp, from the Department of Engineering, will be giving a talk on the nutritional properties of insects, and the environmental benefits of incorporating them into our diet — complete with samples. And for those who fancy a more traditional snack, the road will be lined with food stalls serving up street fare from across the world. All in all, a feast that would make Prince Albert proud. ●

BE PART OF THE EXTRAORDINARY

Join us at our three-day celebration of curiosity, discovery and exploration in South Kensington as a Great Exhibition Road Festival volunteer.

Learn more about the opportunities available and sign up on the volunteering online portal:

► bit.ly/reporter310-festivalvolunteers



Working together

Most modern research involves collaboration, between colleagues and often between disciplines. But when it comes to research involving animals, the most significant collaboration can be between researchers and animal technicians.

GOOD WELFARE IS AT THE CENTRE OF ALL RESEARCH involving animals at Imperial. All scientists who work with animals are supported by the team of vets and technicians from Central Biomedical Services (CBS), who maintain high levels of animal care. Both are committed to the principles of the 3Rs – replacement, refinement and reduction – and their complementary knowledge leads to innovative science, while safeguarding animal welfare.

A good example of this in practice is the research on influenza carried out by Professor Wendy Barclay's group in the Department of Medicine. Her aim has been to study the flu virus in a setting that closely reflects the human situation. Conventional research animals, such as mice and guinea pigs, are not ideal in this respect. They are not naturally infected by the flu virus, and when infection is engineered they show different symptoms from humans.

Ferrets, on the other hand, are naturally susceptible to human strains of flu, but – just like humans – not to bird flus, which are an important source of new infections. Once infected, ferrets fall sick and show clinical signs that are similar to human flu. And the virus can pass from one animal to another in close proximity. This makes them the perfect model for both basic and applied research on influenza and its transmission.

SAFER, HAPPIER ANIMALS

Working with such an unusual animal naturally requires input from CBS, and animal technician Tess Boreham was involved from the beginning. "This is the first group to use ferrets at Imperial, and I helped with the original set-up in terms of housing, environmental enrichment, and cage design," she recalls.



FERRETS ARE FUN,
SOCIAL ANIMALS, AND VERY
RESPONSIVE AND ENRICHING,
AS THEY GIVE MORE BACK
THAN OTHER, SMALLER
ANIMALS.



She also advised on the standard operating procedures and code of practice for working with ferrets, and helped train personal licence holders (PLs, the researchers who conduct the experiments) in how to handle the animals. And handling ferrets is a tricky business.



“Ferrets are feistier than, say, mice or rabbits,” Tess explains. “They require extra time to acclimatise to the environment and handling before we can do any procedures. We ensure they get enough time to get used to us, but for us to get to know them too. During this period we aim to handle them as much as possible during playtime so that their transition to a new environment is smoother for their welfare.”

The importance of handling means that working with ferrets is a team effort. “Our experiments are always a two-person job, if not more sometimes,” says Rebecca Frise, research technician and manager of the Barclay Laboratory (inset, below). “We encourage the PLs to join during the acclimatising period and practice their handling as much as possible pre-experiment. This ensures the animals are happier with us, and we get to know them too.”

Technicians and researchers have complementary skills that are essential for the smooth running of the project. “I’m able to predict how an animal would behave or respond to a procedure, and am able to ensure their safety,” Tess explains. “And knowing what symptoms to expect from a virus or drug we use in our animals helps me determine whether we need to extend or end a study early,” says Rebecca.



But the collaboration begins with the research design. “An experienced, skilled technician can be invaluable when planning new studies, especially when trialling new techniques,” Tess says.

It is also essential for resolving any issues that may arise along the way. “Communication between technicians and the researchers is key to solving most problems,” says Rebecca.

One challenge in the influenza project was achieving virus transmission in a way that reflected the human situation, so between individuals in close proximity, with a small dose of virus passing through the air. “For this to happen a lot of optimising and cage alterations had to be made,” says Tess.

Another issue was detecting when the ferrets had developed a fever after infection. “We had to re-think and move from subcutaneous microchips to implants,” Tess goes on. “This involved a lot of re-training.”

REPLACEMENT, REDUCTION, REFINEMENT

Keeping the number of ferrets used in this work to a minimum was an important consideration. In particular, the team wanted to avoid using uninfected ferrets as ‘sentinels’ to show when an infected ferret was exhaling infectious virus. So they devised a breath sampling device that uses a cell culture to show when the infectious virus is present.

“We worked for many months on optimising airflow, cell culture and researching viral kinetics to be able to detect the virus and get the Influenza Virus Transmission Tube to work,” Rebecca recalls. “It was very time consuming, but in the end we got there.”

For this and other innovations, the team was given the 2017 Provost’s Award for Excellence in Animal Research.

For Tess and Rebecca, the collaboration has been extremely beneficial. “We recommend both research groups and CBS teams work closer together, to get a better understanding of each other’s roles,” says Rebecca.

“This will ensure smoother running experiments,” Tess adds. “Your techniques can be refined and, most importantly, this will ensure the animals’ welfare is at the top of everyone’s priority list.” ●

LEAVING A LEGACY

Mandy Thorpe, Director of Central Biomedical Services (CBS), is retiring after 40 years at Imperial. “It’s an exciting new chapter,” she says, “but tinged with sadness after being at Imperial my whole working life.”

Mandy began her Imperial career as a junior animal technician at Charing Cross Hospital, before moving to St Mary’s Hospital Medical School and then the Royal Postgraduate Medical School. She helped to establish CBS in 1997 and became its Director in 2011. During her career, Mandy has seen new laws on animal procedures, leading to more sophisticated facilities and a stronger culture of care. The animal technician role has also evolved. “As well as day-to-day care of the animals, we now assist the research groups quite closely.”

As Director, she has been central to Imperial’s animal research action plan, culminating in last year’s recognition by the Association for Assessment and Accreditation of Laboratory Animal Care. “Being the first UK university to receive this accreditation is a very prestigious achievement, and particularly rewarding for me.”

Mandy will be succeeded as Director by Rob Floyd, who led the accreditation project for CBS.



Global Imperial

The uncertainty of Brexit has challenged London's vision as a global city and leading hub for higher education. But what is clear is Imperial's determination to keep its doors open to students, collaborations and colleagues from around the world.

WITH THOUSANDS OF INTERNATIONAL STUDENTS AND STAFF, and partners from every corner of the world, Imperial is truly a global institution. This mix of talent, collaboration and reputation has led to Imperial being ranked among the world's most international universities by *Times Higher Education*.

A recent analysis of research publications revealed that more than half of Imperial's research involves an international partner, while Imperial academics have collaborated with peers in over 190 countries in the last few years.

The College has announced major partnerships with France's National Center for Scientific Research (CNRS), Germany's Technical University of Munich (TUM), the USA's Massachusetts Institute of Technology (MIT) and China's Tsinghua University.

This international flow of talent moves both ways and Imperial has many programmes that allow staff and students to spend time experiencing other cultures and building their international networks.

From the students who take the leap to undertake study abroad or research placements, to the researchers forging long-lasting partnerships with colleagues in these countries, we explore what it really means to be the UK's most international university.



Stephen Johns
COMMUNICATIONS
AND PUBLIC AFFAIRS

BRINGING MATHEMATICIANS TOGETHER

France is one of Imperial's closest research partners, with more than 1,000 papers co-authored by French and Imperial academics every year.

The Department of Mathematics has developed a strong relationship with France's National Center for Scientific Research (CNRS) – the largest fundamental research organisation in Europe.

This culminated in the launch of a joint mathematics laboratory last year – the UMI Abraham de Moivre – based at the South Kensington Campus and named after the great French mathematician, Abraham de Moivre who, with fellow Huguenots, moved to England in the 17th century and was instrumental in the development of geometry and probability theory.

France has a rich history of brilliant mathematicians. The country has produced six Fields Medal winners since 1990, including the mathematician Cedric Villani, often described as the 'Lady Gaga of Mathematics', who helped launch the UMI at Imperial.

The UMI has equal status to a CNRS laboratory in France and is led by Imperial's Professor of Applied Mathematics, Richard Craster (pictured). He hopes that the UMI will lead to decades of fruitful partnerships between Imperial and French mathematicians and eventually have "ties with every maths department in France."



Professor Craster said: “Having international links will become more important. Ideas don’t have a passport and don’t go through customs control. We want the ideas to come and go completely freely. The geographical proximity is an advantage – it’s important to collaborate in person and France is so close that you can go for a day trip. We are genuinely friends and neighbours.”

The UMI has already hosted mathematicians from Paris, Toulouse, Marseille and Lyon for up to three months at a time. The visiting French mathematicians have worked with Imperial colleagues on areas such as swarming behaviour, optimal transport and simulations of rare events, and have already published papers together.

Professor Jan Nekovář, who visited the UMI last year from the Sorbonne, said: “I think that the ideas which began developing in my mind during my stay at Imperial will be an important source of inspiration for my further research.”

LEARNING AND TEACHING IN JAPAN

Global higher education is changing rapidly with increased globalisation, marketisation and competition, which together with demographic and societal changes and the fourth industrial revolution, is changing educational need and consumption.

Imperial could soon be working with universities in Japan to ensure that its students are well equipped to be the leaders of tomorrow.

In March, Professor Martyn Kingsbury, Director of the Centre for Higher Education Research and Scholarship, visited Japan to share ideas on how Imperial is implementing its new learning and teaching strategy.

Professor Kingsbury and Nobel physicist Carl Wieman were invited by Tohoku University to give keynote presentations at their ‘International Symposium for Evidence-based Transformation of STEM Education’. They also discussed their ideas on transforming education and active learning – moving away from primarily lecture-based classroom sessions and moving towards more interactive teaching.

Professor Kingsbury said: “They were extremely interested in hearing about our learning and teaching strategy and how we are introducing active learning.”

“We hope to explore whether we can now work more closely to share ideas and learn from each other’s experiences. In terms of evaluating our innovations in science education, being able to compare our own delivery with another country and context will be really useful.”



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STUDYING ABROAD

Our diverse international research collaborations and our own international community produce breakthroughs benefiting us locally, regionally and throughout the world.

In her recent Address, President Alice Gast urged students to take opportunities to experience study and life in different countries and cultures. President Gast said: “Collaboration is important not only across disciplines, but also across cultures. It brings new insights, leads to new approaches and to new discoveries. Spending my postdoctoral year in France opened my eyes to how these differences are beneficial when we work together.”

Through Erasmus+, the College funds around 50 undergraduate year abroad students and 20 undergraduate and postgraduate industrial placements. The College hosts around 100 students from its partner universities for study and up to 70 from various universities for research internships.

There are also several student exchange programmes with institutions such as MIT and the University of Melbourne. Carla Smith, who studies Biochemistry in the Department of Life Sciences, was funded through the Erasmus+ programme to undertake a lab-based research project at the University of Valencia, Spain.

Carla said: “Conducting my own research as part of the cellular neurobiology department was extremely rewarding and allowed me to develop valuable skills that I will always be able to draw upon. I was able to meet so many students from other countries and learn about their culture.

“It was also the perfect opportunity to travel and see more of Spain, to really learn more about how different the culture is across the whole country.”

A new exchange with MIT gives students from Imperial the opportunity to spend up to a year in Boston and vice-versa.

Chemistry student Rebecca Jones (pictured) decided to join MIT through the exchange as it would set her apart from everyone else.

Rebecca said: “I never thought I would get an opportunity like this and so to be a part of MIT and its research is amazing. The exchange programme gives me an extra layer of experience that other people don't have. It's like gap year travelling but on an intellectual level.” ●



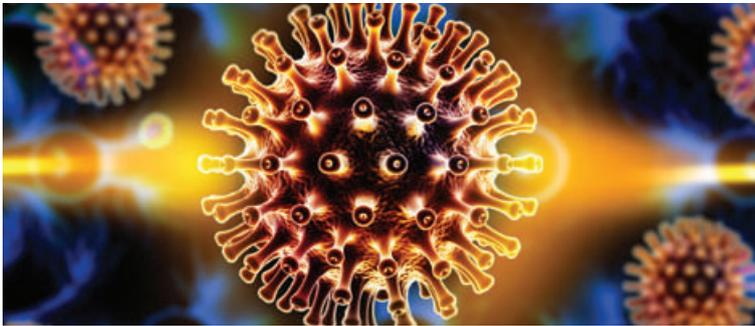
**THE EXCHANGE
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OF EXPERIENCE
THAT OTHER PEOPLE
DON'T HAVE.**



RESEARCH NOTES

FEBRUARY – MARCH 2019

Recording the sounds of Mars and analysing the impact of climate change on the dinosaurs



MEDICINE

HIV hope

A second person has experienced sustained remission from HIV-1 after ceasing treatment, reports a paper involving Imperial scientists. As with the first reported case – known as the ‘Berlin Patient’ – this second patient was also treated with stem cell transplants. The researchers have explained it is too early to say with certainty that he has been cured of HIV, but that the finding offers hope in the search for a long-awaited cure for HIV/AIDS.

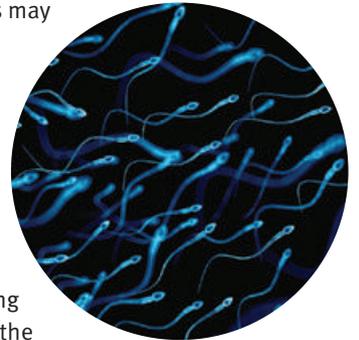
► FULL STORY: bit.ly/reporter310-remission

MEDICINE

Miscarriage insights

Multiple miscarriages may be linked to the poor quality of a man’s sperm, suggests new research from the Department of Medicine. The study team hopes these findings may open new avenues to finding treatments to reduce the risk of miscarriage.

► FULL STORY: bit.ly/reporter310-miscarriage



240+

The number of PhD studentships being funded at Imperial over the next five years by the Engineering and Physical Sciences Research Council, in priority areas of research such as bioengineering, machine learning and next-generation chemical synthesis.

► FULL STORY: bit.ly/reporter310-studentships



Dinosaurs were unaffected by long-term climate changes and flourished before their sudden demise by asteroid strike, reveals a new analysis from the Department of Earth Science and Engineering.

► FULL STORY: bit.ly/reporter310-dinosaurs



WE REALISED THAT FOR THE FIRST TIME WE WERE ACTUALLY RECORDING THE SOUND OF MARS.

Professor Tom Pike in the February episode of the Imperial College Podcast, sharing his work on NASA's Mars InSight mission

► **LISTEN TO THE PODCAST:**
bit.ly/reporter310-podcast



THIS STUDY SHOWS THAT THE IMPACT OF BREXIT WILL REACH FAR BEYOND THE ECONOMY AND MAY AFFECT PEOPLE'S RISK OF DISEASE.

Professor Chris Millet, School of Public Health, lead author of a study exploring the impact of Brexit on food imports and public health.



105,000

The number of international co-authored papers published by Imperial researchers and peers from over 190 other countries in the past decade.

► **FULL STORY:** bit.ly/reporter310-global

GRANTHAM INSTITUTE

Storm connections

An analysis of satellite data has revealed that extreme rainfall events are connected across the world. The research, led by a team of climate scientists at Imperial and the Potsdam Institute for Climate Impact Research in Germany, could help better predict when and where extreme rainfall events will occur around the world.

► **FULL STORY:** bit.ly/reporter310-rainfall



COMMENT



What (or who) is knowledge to you?

Dr Elizabeth Hauke shares key findings from her research on knowledge, knowing and the importance of critical thinking.

Dr Elizabeth Hauke
PRINCIPAL TEACHING
FELLOW, CENTRE FOR
LANGUAGES, CULTURE
AND COMMUNICATION

Elizabeth is an educationalist with an academic background in medicine, sustainable human development and university learning and teaching. Since joining Imperial in 2012, she has designed and developed the Change Makers field of Imperial Horizons. Elizabeth also works with departments to develop new modules, courses and learning experiences for students and provides advice to other higher education institutions about learning innovation and programme design. Alongside her work in the Centre for Languages, Culture and Communication, Elizabeth is currently undertaking a PhD with the Centre for Higher Education Research and Scholarship.

This article is based on 'Understanding the world today: the roles of knowledge and knowing in higher education' published in Teaching in Higher Education.

► **READ THE PAPER IN FULL:**
bit.ly/reporter310-knowledge



In a post-truth era of fake news and alternative facts, it is increasingly important that we, as educators, help students to develop and apply effective critical thinking skills in their engagement with the world. Criticality, the use of reason and analysis to evaluate ideas and information, is tackled differently in various disciplines. It is arguably hardest to develop within traditional science and engineering curricula where the nature of the learning is more atomistic and cumulative. However, criticality is no less important in science and engineering graduates, who are often tasked with becoming innovative problem solvers as well as big thinkers.

The interdisciplinary modules in the Change Makers field of Imperial Horizons challenge our undergraduate students to forge their own relationships with 'knowledge', creating their own ways of finding out, evaluating and understanding. We want our students to encounter the unknown, the uncertain and the controversial, and synthesise their own understandings that retain rather than simplify this complexity.

INFORMATION + KNOWING = KNOWLEDGE

We are all very familiar with information – it is everywhere in the world around us, and in our classrooms, labs and lecture halls. However, we often move straight to the idea of creating knowledge from information without considering the 'knowing'. Knowledge is not a static object that can be defined and acquired. Knowledge is the result of gathering, organising, building, refining and developing understanding over time, and results from 'knowing'. Knowledge may be shared, but each participant will generate their own, individual and internal variant. Knowledge is changed and shaped by the knower, as the knower is changed and shaped by the act of knowing.

Our module 'Lessons from History' explores this process explicitly, with student teams challenged to develop 'knowledge bases' that describe and define historical disasters. Teams must pick a unique perspective from the rest of the class so that as a whole, the knowledge bases are complementary and offer nuanced understandings of the events.

Individual students contribute sources of information annotated with indications of the content, the author, the type of evidence presented, what the source contributes to understanding the event, and whether or not the source is interesting to read or watch. They must also build a team knowledge base – deciding what is ‘required’ knowing and what makes the ‘knowing’ pleasurable, interesting or curious. These processes are explicitly commented by the students to create a narrative of ‘coming to know’.

To further unpack the idea of ‘building’ knowledge, the students have to present their ‘knowledge bases’ in a variety of formats – sometimes as personnel lists or timelines within Blackboard, but also in performative, interactive and physical forms. This year we had these knowledge bases communicated through dance, poetry, plays, mime, origami and as an overhead map with streamers of information that you had to navigate through as you walked underneath.

To develop skills in self-reflection, I challenged the teams to write short stories about their experience of learning on the course. I provided a structure to help them with plot and a list of character types to help them get started. I was fascinated to find that two of the stories featured ‘knowledge’ as a character. In one, knowledge was a princess who needed to be protected, rescued from danger and allowed to grow and develop in safety. In another, knowledge was a mysterious individual that the students needed to find and befriend. This could only be achieved by tackling a number of challenges that showed the students’ different aspects of knowledge’s character. Once they had overcome these challenges, they were able to find and ‘live happily ever after’ with knowledge. Although these stories were simplistic and admittedly a bit tongue in cheek, they nevertheless revealed novel conceptualisations of knowledge that moved beyond the explicit discussions that we had during the module.

Hopefully by working with students to view knowledge as a ‘development of knowing’, a process that they can practise, master and use, they will become empowered to use this criticality to inform their engagement with the wider world. ●

LIVE, LOVE, LEARN

The Change Makers modules focus on three core elements that bring together a range of theoretical perspectives and tools for teaching and learning.

- **LIVE:** prior learning, individual and collective experiences are valued as a foundation for new knowledge and understanding of the lived world.
- **LOVE:** empathic engagement with others critically anchors learning to the real, messy, intricate needs of individuals and communities around the world.
- **LEARN:** pursuing challenging, active learning is vital to create independent, critical thinkers who approach complexity with confidence and self-awareness.

TEACHING NOTES



Supporting inclusive excellence

At an event in March, teaching teams from across the College supported by the Excellence Fund showcased their initiatives to develop and encourage more inclusive learning and teaching at Imperial. The showcase included a new module for final year MEng students that encourages them to address the diversity of robotics users and designers, and a project to support inclusive teaching for students with specific learning differences.

Caring community

Imperial students have been sharing their insights with community groups across London. The initiative is an example of social accountability and engagement within the updated BSc Global Health. The degree now has a far greater focus on the social benefits of strong communities, in addition to targeting disease prevention.

Some 37 students took part in the project in 2018, working alongside 13 different community groups to understand local health inequalities and effect strategies to reduce disparities in people’s health and wellbeing.

“This is something that lectures and textbooks can’t teach you” said Jinpo Xiang, 4th Year BSc Global Health student.

AI education

The College is launching one of the world’s first online degrees in Machine Learning. From autumn 2020, students will have the opportunity to work with industry-standard tools like PySpark and PyTorch to develop and apply their Machine Learning and data science skills.

LONG SERVICE

Staff featured in this column have given many years of service to the College. Staff listed celebrate anniversaries during the period 1 January – 1 April 2019. The data are supplied by HR and correct at the time of going to press

30 YEARS

- Julia Anderson, Senior Advisor, Institute of Global Health Innovation
- Professor Laki Buluwela, Professor of Cancer Medicine, Surgery and Cancer
- Professor Peter Collins, Professor of Clinical Cardiology, National Heart and Lung Institute
- Geraldine Farrell, Library Assistant, Library Services
- Alan Finch, Technician, Physics
- Gill Martin, Senior Support Technician, National Heart and Lung Institute
- Professor Eric Yeatman, Head of Department, Electrical and Electronic Engineering

40 YEARS

- Professor John Kilner, BCH Steele Chair in Energy Materials, Materials
- Harry Vine, Departmental Services Manager, Physics
- Brian Willey, Technician, Physics
- Julie Williams, Grants Manager, Faculty of Medicine

SPOTLIGHT

JULIA ANDERSON

30 YEARS

“Over the 21 years I worked there, the Department of Surgery and Cancer more than doubled in size and in complexity. I was fortunate to be asked to join a number of College wide projects, which facilitated a much wider engagement across College, which I valued greatly.

I think I stayed at Imperial for so long because there seemed no point in moving – it wasn’t going to get more exciting than it was here. There has always been a new challenge – just as you thought it might quieten down, something else would arise.

I’ve been so lucky to have worked for and with some remarkable people. Each of the Heads of Departments I worked for were exceptional, and opened so many opportunities – so lots of fun as well as hard work! And the admin team we established in Surgery and Cancer were



tremendously supportive and hard-working, willing to engage in new initiatives and to drive change.

I retired from my role as Departmental Manager for Surgery and Cancer last summer, and took up a new part-time role as Senior Advisor in the Institute for Global Health Innovation (IGHI). It’s great to be more closely and directly involved with the Institute with which I have been associated since its inception nearly ten years ago, and to get to know the team better.

HONOURS

ENGINEERING

Engineering election

Professor Molly Stevens (Materials and Bioengineering) has been elected as a Foreign Member to the US National Academy of Engineering. The election, which makes Professor Stevens one of 272 ‘foreign members’ of the Academy, recognises her contributions to materials-based approaches for tissue regeneration and biosensing.



NATURAL SCIENCES

Geometry

Professor Simon Donaldson (Maths) has been awarded the 2019 Oswald Veblen Prize in Geometry, along with Professor XiuXiong Chen (Stony Brook University) and Professor Song Sun (University of California, Berkeley). The trio received the prize for their three-part series, “Kähler-Einstein metrics on Fano manifolds, I, II and III”, published in 2015 in the *Journal of the American Mathematical Society*, in which they proved a long-standing conjecture in differential geometry.



GRANTHAM INSTITUTE

Directing change

Professor Jo Haigh is retiring from her role as Co-Director of the Grantham Institute in early May, and will take up an Emeritus Professorship in the Department of Physics. Professor Martin Siegert, who is currently Co-Director alongside Jo, will continue to lead the Institute while a new Co-Director is recruited.

Professor Siegert said: “Jo’s leadership of the Institute has been truly exemplary, helping to develop it as the friendly, supportive and communicative Global Institute it is today. Personally, we will miss her dedication to the science of climate change and its translation to the public, policy and business communities, as well as her in-depth knowledge of Imperial and advice on how to simply get things done in the complex university environment.”



IN MEMORIAM

Remembering Andy Sellick

Andy Sellick, a member of the post room team, died unexpectedly in April at the age of 49. Affectionately known as ‘Shrek’, Andy was kind, gentle and larger than life. He was well-known around College, especially for his wonderful Christmas hats.

Andy was a valued team member and friend and made Imperial a brighter and happier place – he will be much missed.



IN MEMORIAM

Dr Marcus Dorner



Dr Marcus Dorner, Senior Lecturer in the Department of Medicine, died suddenly in February this year, aged 38. Professor Paul Farrell reflects on his colleague’s career.

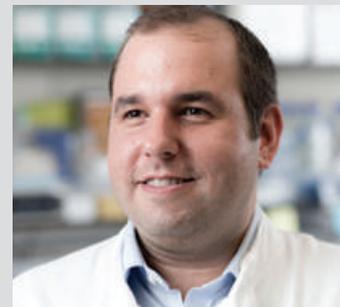
Marcus was an internationally recognised leading scientist in his research field of hepatitis virus replication. In many parts of the world the hepatitis viruses are major causes of human disease, particularly viral hepatitis and primary liver cancers.

Marcus graduated in Chemistry from the Technical University of Munich in 2002 and completed his MSc in Analytical Chemistry and Biochemistry in Munich in 2005. He then successfully obtained his PhD in the laboratory of Professor David Nadal in Zurich in 2009. At that time, Marcus worked mainly on another human virus, the Epstein-Barr virus. A definitive step in his career happened when he joined the laboratory of Professor Charles Rice at the Rockefeller Institute in New York for postdoctoral work (2009–2013). This was an exceptionally productive period and included the publication of two outstanding *Nature* papers, which determined the high research reputation that Marcus achieved and maintained throughout the rest of his career.

In 2013, Marcus joined Imperial College London and developed his own research laboratory, where he pioneered novel systems to study replication of hepatitis viruses, and further developed the use of advanced mouse models to study the interaction of viruses with the host immune system.

A key problem with research and clinical development of novel treatments for hepatitis B and C viruses was that their replication was very poor in the usual laboratory systems – cell culture and standard laboratory animals. Marcus made major contributions to overcoming those problems. At Rockefeller, by identifying all the barriers to hepatitis C virus replication in laboratory mice, he was able to make several genetic modifications to the mice which resulted in completion of the entire hepatitis C life cycle in the mice. For hepatitis B virus in cell culture, his Imperial laboratory used novel 3D microfluidic liver cell cultures to obtain the full hepatitis B life cycle. In these cells, the innate immune and cytokine responses following infection mimic those observed in patients, allowing identification of pathways important for immune evasion and development of biomarkers.

Marcus was a popular member of staff who contributed fully to the College. He was a very good teacher, won many research grants and led a dedicated team of researchers and PhD students in his group. Marcus was also an enthusiastic research collaborator, bringing his skills with mouse systems to the study of a wide range of other viruses including HIV and Dengue. He will be greatly missed.



REVIEW

Imperial's innovation on display

ENTERPRISE MONTH, MARCH 2019

An imaging tool which could make avoidable blindness a thing of the past and a breathable, washable orthopaedic cast were the big winners at the finals of Imperial's flagship student entrepreneurship competitions in March.

Enterprise Month 2019 involved four weeks of competitions, bootcamps and exhibitions. Organised by the Enterprise Lab, the month highlighted the best of student innovation and entrepreneurship, and showcased the wealth of support on offer for student innovators.

The WE Innovate final on 7 March marked the culmination of six months of masterclasses, coaching, networking and investor meetings for the programme's five female-founded



startups. Biomedical Sciences student Suchaya Mahuttanatan won first prize for Cadget, an orthopaedic cast with a unique lattice design that means it is breathable. Manufactured from a material that can turn from flexible to permanently stiff in minutes, Cadget can be moulded to each individual patient, making the process faster and more comfortable for patients than existing fibreglass or plastic casts.

At the Venture Catalyst Challenge final two weeks later, VUI Diagnostics (pictured above) took home the £30,000 top prize for their simple, affordable and accurate retinal imaging tool, which could dramatically speed up the diagnosis of

diseases that lead to sight loss.

The company's founders, medical students Simon Rabinowicz and Uddhav Vaghela, developed their prototype with the support of the Imperial College Advanced Hackspace, and they hope to commence clinical trials later this year.

Elsewhere during March, students at the Dyson School of Design Engineering exhibited their work at the School's Open House; the Business School hosted a one-day innovation and entrepreneurship bootcamp; and teams of secondary school students participated in the Schools Science Competition, led by the Faculty of Natural Sciences.



REVIEW

Wonder women

WOMEN@IMPERIAL WEEK, 18–22 MARCH 2019

New portraits of 20 Imperial women, to be hung across the College's campuses, formed part of the lasting legacy of this year's Women@Imperial Week. Researchers, teachers, technicians, directors and customer service managers shared their advice for the next generation, and talked about their personal and professional journeys.

The week also featured the latest in Imperial's series of after-hours evenings of discovery, as Imperial opened its doors to the public for a celebration of the College's Wonder Women. Visitors met Imperial female researchers in fields from pharmacology to future fuels, while a panel discussion between Dr Jess Wade, Dr Charlotte Webb and Dr Farzana Dudhwala explored gender bias online.

► VIEW THE NEW PORTRAITS: bit.ly/reporter310-women

Coming up this Spring at Imperial

Making the most of warmer days with graduation celebrations, a Garden Party and a Festival like no other.

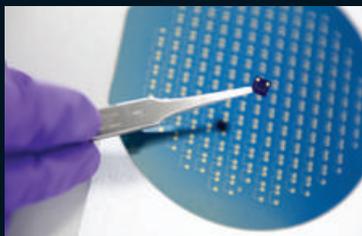
► SIGN UP FOR A EVENTS FULL LISTING: www.imperial.ac.uk/whats-on

29 MAY, 17.30

Bioengineering Lecture 2019

Presented by Professor Albert Van Den Berg, an expert on nanotechnology-miniaturization in physics, chemistry, biology and biotechnology.

Lecture theatre G16, Sir Alexander Fleming Building, South Kensington Campus



5 JUNE, 12.30

Athena Lecture

Margaret Heffernan, CEO, writer and lecturer, delivers a lecture on scientific leadership.

Lecture theatre 200, City and Guilds Building, South Kensington Campus



13 JUNE, 17.30

Institute of Molecular Science and Engineering Annual Lecture

Tony Wood, Senior Vice President, Medicinal Science & Technology, GSK will give the Institute's inaugural Annual Lecture on challenges to advance medicines to patients.

Lecture theatre G16, Sir Alexander Fleming Building, South Kensington Campus



18 JUNE, INVITE ONLY

President's Awards and Imperial Garden Party

This special annual event brings together staff and students at the College who have received or been recognised for internal achievements, awards and accolades. An awards ceremony for the President's Awards for Excellence will also take place. Great Hall and Queen's Tower Rooms, South Kensington Campus

16 JULY, (TIME TBC)

Support Services Summer Party

Annual gathering of support staff from all across Imperial. Queen's Tower Rooms and Lawn, South Kensington Campus



HIGHLIGHTS



8 MAY, FROM 10.00

Postgraduate Graduation

Friends, families and academic staff come together at the South Kensington Campus and the Royal Albert Hall to celebrate the achievements of our graduating students.

Royal Albert Hall, South Kensington

13 MAY, (TIME TBC)

Dyson School of Design Engineering: building opening

Imperial's newest department officially opens the doors to its inspiring new building, with a celebration of design engineering and the generosity of the Dyson Foundation.

Dyson Building of Design Engineering, South Kensington Campus

THE GREAT 2019 EXHIBITION ROAD FESTIVAL

28-30 JUNE

The Great Exhibition Road Festival

For the first time ever, Imperial's Festival will join up with all the other institutions in South Kensington to form one giant fusion of the arts, science, learning and curiosity.

Exhibition Road, South Kensington

EXPERIMENT
CURIOSITY
CURIOSITY

THE GREAT **2019** EXHIBITION ROAD FESTIVAL



IMAGINE
ART
PERFORM
DESIGN
CREATE
FUTURE
PLAY
MAKE

EXPLORE THE EXTRAORDINARY

28–30 JUNE 2019

Join us at our three-day celebration of curiosity, discovery and exploration in South Kensington as a Great Exhibition Road Festival volunteer.

From interacting with visitors, to helping out behind the scenes, there's a chance for everyone to be involved and help share the amazing things that our community does every day.

Learn more about the opportunities available and sign up:

[BIT.LY/REPORTER310-FESTIVALVOLUNTEERS](http://bit.ly/reporter310-festivalvolunteers)

SIGN UP
BY 7 JUNE



TAKE NOTE

Mental Health Awareness Week: 13–17 May 2019

Self:Care

We have developed a week of activities focusing on how we can take care of our bodies and minds. Sign up for sessions ranging from meditation workshops to a lunchtime walk.

What #OrdinaryMagic did you do today?

During the week we'll be sharing examples of what our staff and students do to take care of themselves. Share your stories on social media using #OrdinaryMagic.

► **VIEW THE FULL PROGRAMME:**
bit.ly/reporter310-mentalhealth

IMPACT

Imperial's talent development programme for Black, Asian and Minority Ethnic staff is now open for applications. The programme is free for Imperial staff and is endorsed by the Institute of Leadership and Management. Applications close on Monday 3 June 2019.

► **FIND OUT MORE AND APPLY:**
bit.ly/reporter310-IMPACT

We are reacting

Thank you for sharing your thoughts about working at Imperial through the 2019 Staff Survey. You can find out more about the results at the roadshows hosted by the Provost, Professor Ian Walmsley, and the Director of Human Resources and Organisational Change, Louise Lindsay, during June 2019.

► **ACCESS THE ROADSHOW DATES:**
bit.ly/reporter310-roadshows

