



Imperial ENGINEER

SUNRIDERS
GEOINTERN 2023
FUSION ENGINEERING
THE LITTER-AL TRUTH
THERE AND BACK AGAIN
MISUNDERSTANDING MINING

For members of City & Guilds College Association
and The Royal School of Mines Association

ISSUE 39 *AUTUMN 2023*

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As we enter a new academic year, we should look back on the past with a certain degree of satisfaction. Imperial's results in the National Student Survey have shown significant strides.

Notably, Imperial has attracted scores for "Teaching", and "Learning Opportunities" – in Engineering and Computing – that exceed the national benchmarks by significant margins. Our endeavours in engineering research, and their impact on the world stage, continue to shine, with five members of academic staff being elected Fellows of the Royal Academy of Engineering.

Imperial has recently ramped up the Schmidt Fellowships in AI for Science, whose appointees will be advancing the application of AI to science and engineering, as part of Imperial-X (I-X); with our depth and span of activities in engineering analysis and design, few Universities are as well placed to take meaningful strides in this area.

I will end with the warmest of greetings directed to our new engineering students. Welcome to what is a remarkably vibrant, connected and diverse community: your futures are bright!



**Anil
Bharath**

PRESIDENTS REPORT



**Tim
Cotton**

This will be my last report for the Imperial ENGINEER as I am very happy to report that I am handing the Presidents Medal to Paul Holmes. Paul is well known to us at the RSMA having served as the Honorary Secretary for 12 years up until 2016. I wish Paul every success in presiding over the Association and I look forward to working with him over the next few years. I have thoroughly enjoyed my time as President and have been fortunate to be able to enjoy the spirit of the RSM once again. Huge thanks to all the hard working Committee members who do so much to keep the Association on track and maintain the simple goal of fostering an enduring link between members of the Association, and with the staff and students of the RSM, thereby promoting comradeship and a source of mutual help and advice.

Whilst the Committee has a growing level of membership, time commitments of the members mean that filling the Executive roles in the Committee is becoming harder. If you do have time, please do consider joining the RSMA Committee, it is truly worth it as you can see first-hand the tremendous impact that giving back has on the current student body.

As a volunteer organisation, we rely heavily on the College Alumni Relations team in managing the communication channels with members, as they have the systems and people to do this type of work. The Committee has a good working relationship with these departments who are a great help in running the administration side of the Association and getting any feedback from Members out to the Committee. Nicola Pogson has retired as the Director of Alumni Relations and the RSMA wishes Nicola well on her retirement. We are all very grateful for Nicola's support to the Committee over the years and to the wider RSM student and Alumni bodies, it has been appreciated.

I am very happy to report that due to the success in 2022, the RSMA once again launched the RSMA 100 Club Final Year Student Bursary Prize, in May 2023. This award is open to students who began their final year in September 2023. During 2022, the Association raised the level of funding so that each Bursary is worth £1250. Currently, the Committee is planning to award a minimum of three prizes across ESE and Materials and, depending on applicants, may consider more. As we go to press there are 12 applicants being considered with a good mix across the disciplines in the RSM. The scheme was created to reward students who show the true RSM Spirit and act as ambassadors for the RSM. Successful candidates must be able to show commitment, achievement and excellence above that of their peers in areas such as academic excellence, community & RSM Union involvement, sporting prowess, or contribution to a sport or club within the RSM. Financial hardship will also be considered as a criterion. Working with Department Directors of Undergraduate Studies at ESE, Materials and the Faculty of Engineering we will be shortlisting and awarding the bursaries shortly. Remember the funds have been raised by YOU through your kind generosity at events

Continues overleaf...

NEWS & REVIEWS

Tim Cotton, continued from page 3

and specifically by those members who have supported the 100 Club. This is an amazing achievement and is a concrete example of former students of the RSM who want to give back to the current student body. Lastly, the 100 Club continues to slowly grow and I would encourage you, if you are able, to sign up and support the RSMA via the 100 Club or by a one off donation. If you are already signed up, then a huge thank you and please double check your banking details so that you are continuing to pay yearly. Your support is truly appreciated!

The Committee continues to maintain a very active relationship with the RSMU and for the 2023/24 academic year, the new RSMU representatives are Rhea Chandresh and Hettie Holmes, respectively President and Honorary Secretary. Already, they are an active part of the Committee with great ideas and support.

Finally, the Committee has approved the 138th annual dinner, (138th although the first dinner was held 150 years ago) to be held on Friday 24th November 2023 at the Rembrandt Hotel in Knightsbridge. This year we are excited to welcome Steve Kesler as our guest speaker. Read below for more details on the event and a brief biography of Steve.

I hope you find this issue informative and Paul and I look forward to seeing some of you in the RSM and/or at an RSMA event at some point soon.



A few words from Paul Holmes. *“It is a great honour for me to take over as President of the RSMA and to continue the work that Tim has led for the past 7 years. I would like to thank Tim for all he has achieved and for steering, and ultimately strengthening, the association through some challenging times. Thankfully, he will take up the post of Treasurer and I will be able to call upon his wisdom and candour going forward. My experiences at the RSM, and contributing through the RSMA, has remained a core feature since graduating nearly 30 years ago. I look forward to supporting the current and future students and ensuring the comradery of the Association continues to grow.”*

138th RSMA Annual Dinner

Book your place for the 138th RSMA Annual Dinner, Friday 24th November 2023

Once again, the RSMA Committee will be hosting the 2023 Annual Dinner at the Rembrandt Hotel in Knightsbridge at 11 Thurloe Place. The event will start at 7:00-7:30pm – a three course dinner with wine and tea/coffee.

This year, the RSMA is especially delighted to say that we have arranged for Steve Kesler to speak to our assembled members and guests.

Steve graduated from RSM with B.Sc Mining and PhD Mineral Technology in 1977 and started his mining career with Rio Tinto on the start up of the Rossing uranium mine in Namibia. As General Manager, he navigated the company through the politically sensitive transition to Namibian independence. He was then seconded by Rio Tinto to the BHP managed Escondida mine in Chile that had just been commissioned, with the remit to determine its potential. Soon recognising the size and quality of the resource, he led the expansions, developing Escondida to become the largest copper mine in the world with a capacity of 1 million tpa copper. He was then the first CEO of Collahuasi in Chile, taking it from feasibility and financing into construction as the

second largest copper mine in the world.

He joined Billiton, on its listing in London in 1997, as Executive Director charged with growing its base metals business and led the acquisition of Rio Algom with its suite of copper projects in South America. Leaving Billiton on its merger with BHP, he joined Washington Group International in the USA, to grow its mining and EPCM business worldwide, taking the company from its USA base into projects in Mexico, Bolivia, Jamaica, Niger, India and Australia.

After working with major mining and engineering companies he changed direction and took positions as CEO of junior development companies in many commodities and jurisdictions – gold in Colombia, nickel in Philippines, iron ore in Sierra Leone and lithium in Austria. He is currently Executive Chairman of CleanTech Lithium developing lithium brine projects in Chile using direct lithium extraction and renewable energy to deliver ‘green’ lithium to the US and EU markets to support the transition to a decarbonised world.

So grab your formal evening attire and book a ticket now!



Steve Kesler

CGCA 2023 AGM

The CGCA Annual General Meeting was held on Monday, 5th June. It was our first AGM that had a physical element since before the pandemic, with members present in the Skempton Building of Imperial College and joining using the ZOOM facility.

Before the AGM started, our President, Professor Anil Barath, gave a presentation on the hot topic of the moment, Artificial Intelligence, (AI). Anil ran through the structure of AI models, and the amazing growth in size (in terms of neurons) and abilities. The ability to interpret an open question, mine the relevant information, structure it and reply in well written sentences has come to fore within the last year. Many examples are in the public domain, some freely available.

Text is not the only field that AI has entered. Pictures are also covered, and Anil demonstrated, live, creating images of South Kensington. And looking to the future, with AI developing AI, the pace will only increase.

On the stroke of 18:30, the leading edge of technology gave way to Anil's Annual report, and Andrew's Accounts for 2022 as the AGM started! A stunning transformation by any standard.

In his Annual Report, Anil covered:

- The Annual Dinner in February, which ran smoothly (thanks to a lot of work behind the scenes by Colin Kerr and team) and was very well attended, comparing well with 2021 which was held in the immediate post-Covid lockdown time. Anil will be assisting Colin in assuring a prominent guest speaker for 2024.
- The Reunion, held in November. Organised again by Peter Chase, a group of alumni and their guests gathered in the Library of the Polish Club, and had an excellent lunch wrapped in great banter and reminiscing about times at College.
- The two issues of Imperial ENGINEER (IE) released in the year were well up to the high standard of this much anticipated journal, and Anil thanked Peter and Alison Buck for their efforts.
- A final mention went to the board of the Old Centralians' Trust, which continued its work in supporting engineering students on expeditions, to attend and present at conferences and in some cases to weather hardship caused by the testing economic times.

Andrew Hill presented the 2022 Accounts to the meeting. The Accounts are still awaiting final sign off by the Accountants, but the draft presented was not expected to change.

The Association had run very much as expected for the year, with no exceptional items.

Overall, CGCA made a £10K loss on income vs costs.

Due to the economic situation in 2022, the investments ended the year at £177K, down by £30K on 2021, but this is in line with markets. By June 2023, investments had made a modest recovery to £181K.

During the year, a £15K drawdown had been necessary for running costs like IE production.

Andrew also handled the next item and the Accountants, Haynes-Watts were retained for another year.

To conclude his items, Andrew

announced he would not be standing for re-election as Treasurer but would stay with the Committee to ensure a smooth handover.

Anil thanked Andrew for his contribution to CGCA, commenting that he also felt our finances were in a 'Safe Pair of Hands'.

The meeting moved on to the election of officers for 2023-24. As a result, the Committee is now as shown in the table below.

In Any Other Business, Anil requested that more members become involved in the running of the Association and organising events. He had identified a volunteer to join Colin in arranging the Annual Dinner and requested a volunteer from the current student body as well.

The Meeting closed at 19:45.

CGCA Committee Members, 2023-24

Post

CGCAL Directors

President
SNR Vice President
Previous President
Honorary Secretary
Honorary Treasurer
Younger Members Hon Sec
Honorary Membership Sec

Holder

Professor Anil Bharath
Professor Kelvin Higgins
Professor Atula Abeysekera
Nigel Cresswell
Allan Lee
Tim Munday
Hayley Wong

Committee Members and Co-opted Members

Aero Eng Representatives	Hayley Wong
BioEng Representatives	Milia Hasbani
Chem Eng Representatives	Fatima Khan
CivEng Representatives	Colin Kerr/Tim Munday
Computing Representatives	James Prince
Design Eng Representatives	–
E&E Representatives	–
Mech Eng Representatives	Owen Heaney
Dep Hon Sec	–
Dep Hon Treasurer	James Prince
IE Editor	Peter Buck
Annual Dinner Organiser	Colin Kerr
London Walks Organiser	Alice Spain
Reunion Organiser	Peter Chase
Co-opted – Prev Treasurer	Andrew Hill
Co-opted – Obituaries	Chris Lumb
Co-opted – Communications	Fatima Khan

In addition, the following join the Committee in ex-officio/advisory roles:

Regional Representatives:	Dave Bishop (Aus) Leslie Swann (HK) Cheah It Tee (Mal) Richard Gundersen (SA)
CGCU:	Daniel Zhou (CGCU President) Zelin Shao (CGCU Alumni Officer)
Imperial Alumni Department:	Kristin Gembiak

DIARY

Because of COVID-19, some events may still be virtual or hybrid. Local restrictions may have been lifted or relaxed, but please contact event organisers to confirm restrictions in place.

RSMA Toronto, Canada

Informal RSM meeting

Last Friday of every month, noon.
Jason George Pub,
100 Front Street East, Toronto
Contact: rsm.1851@gmail.com

RSMA Perth, Australia

Monthly Sundowner

First Friday of every month.
The Celtic Club,
48 Ord St, West Perth, WA, 6005
Contact:
Alan Dickson – alan@dickson.com.au
John Sykes – johnpsykes@gmail.com

Imperial Alumni, Houston, US

Alumni social

Third Thursday of every month, 6pm
Capital Grille, 840 West Sam Houston
Pkwy N, Houston, TX 77024
Contact: Matt Bell –
matt@in2oilandgas.com

Imperial Engineering Alumni, Johannesburg, South Africa

Quarterly Johannesburg Lunch

(15th Nov, 21st Feb, 15th May, 21st Aug)
Baron & Quail, Woodmead,
Johannesburg, South Africa
Contact: Richard Gundersen –
Gundersen@yebo.co.za

Imperial Lates:

Future Food

Thursday, 9th Nov 2023, 18:00-21:00

Space

Thursday, 7th Dec 2023, 18:00-21:00

Sex, Mating & Reproductive Health

Thursday 8th Feb 2024, 18:00-21:00

Artificial Intelligence

14th Mar 2024, 18:00-21:00
Contact: Lates@imperial.ac.uk

Imperial Black Alumni Network Building Global Bridges

First annual symposium for all alumni and current students
Wednesday, 8th Nov 2023, 18:30-19:45
Online, free, but register in advance.
Contact: alumnievents@imperial.ac.uk

RSMA

138th Annual Dinner

Friday, 24th Nov 2023
Rembrandt Hotel, Sth. Ken. SW7 2RS

Imperial Engineering Alumni Traditional Reunion Luncheon

For engineers who graduated in a year ending in a '3' or a '8' – C&G and RSM graduates all welcome.
Saturday, 25th Nov 2023, 12:30 for 13:00
Rembrandt Hotel, 11 Thurloe Place,
South Kensington SW7 2RS
Booking form was enclosed with IE38

CGCA

110th Annual Dinner

Friday, 1st Mar 2024, 18:45 for 19:30
Stationers' Hall, Ave Maria Lane, EC4M 7DD
Booking form enclosed with this issue.

An up-to-date calendar of events is always available on the CGCA and RSMA websites. Imperial College maintains a calendar of college events at bit.ly/IE-WhatsOn and the Friends of Imperial College regularly organise events of interest to alumni (see bit.ly/IE-Fol)

Please note that while many of these events are open to all and often free, they usually require registration in advance. Please follow the links in the entry to get more information including if and how to register and whether there is any cost.

For more information follow links, or see page 2 for contact details

RSMA Beer 'n' Bite Event

The annual RSMA Beer 'n' Bite was held on 29th June at Stein's Berlin overlooking Princes Gardens. The event hosts the final year students and enables networking with RSMA members and provides welcome relief after the exam season.

Forty five students and alumni gathered at Stein's. Traditional Berlin fare was served with a range of different sausages.

The RSMA provides sponsorship for the event and student tickets are at a reduced rate. The function also provides a focus on getting students to join the RSMA so, in time, they can help support current students. Following the event, over half the students who attended have joined the RSMA.



Photos: RSMA



DEVELOPMENTS AROUND THE ENGINEERING FACULTY

Imperial to lead UK in global electricity decarbonisation effort

Imperial is leading the UK arm of a global effort to create 100% renewable energy power grids worldwide.

The new Electric Power Innovation for a Carbon-free Society (EPICS) centre, based at Johns Hopkins University (JHU) in the US, brings together international partners in the UK, US, and Australia to decarbonise the global energy sector.

The global project is funded by £13 million, with £6.67m going to the UK arm. Imperial is leading the UK's involvement in the centre, which is funded by UK Research and Innovation (UKRI), and will be working alongside academics at University of Edinburgh, Newcastle University and University of Strathclyde.

The project will provide answers about the innovations and changes needed in today's power grid management and institutions to meet the demand of a grid with 100 per cent renewable energy that is sustainable, affordable, reliable and resilient.

Professor Mark O'Malley, UK lead of EPICS, and **Leverhulme Professor of Power Systems** at Imperial's Department of Electrical and Electronic Engineering, said: "A global transition towards net-zero electricity grids is vital to tackle the climate crisis, but there are challenges we need to address to make this happen. For example, most renewable energy sources are connected to the grid with power electronics and not synchronous machines, and we do not know how to reliably plan and manage power electronic dominated grids.

"A global collaborative approach with our academic partners and global industry and policy stakeholders from the Global Power System Transformation Consortium, Energy Systems Integration Group, and Future Power Markets Forum is exactly what's needed to spearhead such an effort. I look forward to working with our global and UK partners to make 100 per cent renewable energy a reality."

The US efforts, which are led by JHU, are being funded by the US National Science Foundation (NSF), while the University of Melbourne is leading the Australia contingent, funded by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia.

Professor Ben Hobbs, US EPICS lead at JHU, said: "These countries can collaborate and lead the world in dealing with common challenges, such as integrating grid-scale

long-duration energy storage and offshore wind power resources, as well as addressing climate-induced hazards."

EPICS will develop computing, economic, engineering, and policy methods and tools to enable a 100 per cent emissions-free power grid. To do this, the researchers will establish a global innovation ecosystem, engaging US, UK and Australian academics and global industry and policy stakeholders.

Dr Jess Britton, who leads the University of Edinburgh's EPICS input, said: "Transforming energy grids to support 100 per cent renewable energy is a global challenge that will require technical, policy and governance innovations. Demand-side flexibility can play an important role in enabling a decarbonised and resilient energy system and this international collaboration will support acceleration of customer flexibility in an equitable and fair way."

Professor Keith Bell, who leads the University of Strathclyde's EPICS input, said: "The physics of electricity and the technologies available to us are the same everywhere, but each country's power system is unique. This means that challenges and opportunities will emerge in some places before others. A global collaboration like this allows us to share and learn from those experiences, ensuring a smoother and most cost-effective path to a zero carbon energy system."

EPICS's research interests are divided into four themes, which will:

- Harness the latest advances in computer technology to enable decision-making tools to handle the unpredictable nature of renewable energy resources like wind and solar.
- Find ways to accommodate wind, solar and storage resources into the grid, which requires learning how to operate large numbers of inverters that connect these resources and the grid.
- Develop economic analysis principles tailored for making decisions about how to design and then reliably operate 100 per cent renewable power grids.
- Use insights from the above efforts to develop strategies for achieving net-zero power grids globally, and use them to reduce and eventually eliminate carbon emissions from other economic sectors, including transportation and buildings.

<https://bit.ly/IE39-EPICS>



Photos: Imperial College

Professor Mark O'Malley, Leverhulme Professor of Power Systems in the Department of Electrical and Electronic Engineering



Dr Elina Spyrou, Leverhulme Lecturer in Power System Transformation, Department of Electrical and Electronic Engineering



Dr Balarko Chaudhuri, Reader in Power Systems, Department of Electrical and Electronic Engineering



Professor Pierre Pinson, Chair in Data-centric Design Engineering, Dyson School of Design Engineering



Dr Fei Teng, Senior Lecturer, Department of Electrical and Electronic Engineering



Professor Richard Green, Head of the Department of Economics and Public Policy, Imperial College Business School

Global Hydrogen Economy

Imperial is also involved in a second centre: the Global Hydrogen Production Technologies Center (HyPT), which is led in the UK by Cranfield University in collaboration with Arizona State University, University of Adelaide, and University of Toronto. The global project is funded with £14.1 million.

HyPT will analyse the social and environmental system changes needed to build a global hydrogen economy, addressing how to make it affordable and looking at the impact production has on local communities and ecosystems. Researchers will also develop pathways to adopt it as a source of energy for energy-intensive and hard-to-abate industries such as ammonia, steel, cement, aluminium, and transportation.

Imperial co-leads **Professor James Durrant**, Department of Chemistry, and **Professor Nick Voulvoulis**, Centre for Environmental Policy, said: "We're excited to be part of this Global Centre addressing the challenge of green hydrogen synthesis, which aligns closely with Imperial's Towards Zero Pollution initiative, and also brings together complementary expertise from our Centres for Processable Electronics and Environment Policy."

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

Dr Reshma Rao wins Asian Women of Achievement Award

The Women of the Future Programme runs two awards, The Women of the Future Awards and Asian Women of Achievement Awards. The Asian Women of Achievement Awards 2023 were held on Thursday 8 June at the Hilton London Bankside. The Awards spotlight the extraordinary achievements of Asian women across the UK. The awards ceremony has 13 categories, with awardees being recognised in business, the arts, media, sport and social and humanitarian work.

The Science category was won by **Dr Reshma Rao**. She is a Royal Academy of Engineering Research Fellow in the Department of Materials and her research aims to develop catalytic materials for splitting water – a first crucial step in creating green hydrogen fuels.

Using spectroscopic techniques, Dr Rao investigates the molecular details of the water-splitting reactions on various materials. Using this information to determine which steps limit the efficiency of such reactions in a range of conditions could lead to new ways to improve the activity, stability, and selectivity of materials for green hydrogen production from contaminated or low-grade water.

On receiving the award, Dr Rao said: "It is an honour to receive this award. I hope I can use the Women of the Future platform to encourage and celebrate the contributions of women of colour in science!"

The awards have led to the creation of numerous initiatives and projects designed to help women and improve opportunities for the next generation.



Photo: Imperial College

Dr Rao will be invited to join and engage in opportunities through the Women of the Future Network and Women of the Future Ambassadors

Programme, as well as acting as an ambassador in future school initiatives with sixth-formers.

<https://bit.ly/IE39-Rao>

Imperial rises up world university rankings

Imperial has gone up in the world rankings and remains third in the UK in the latest Times Higher Education World University Rankings for 2024.

Imperial has risen two places from tenth to eighth in the world in this year's rankings and is, once again, top London university in the rankings. Imperial also recently placed among the world's top ten universities in the QS World University Rankings for 2024, and was named University of the Year in the Daily Mail University Guide 2024.

Imperial's President, Professor Hugh Brady, said: "This latest recognition is testament to the achievements and dedication of our staff and students who are taking on the world's big challenges. Imperial keeps going from strength to strength and I'm hugely proud of our research, teaching, convening power and impact."

In its 20th year, the Times Higher Education (THE) World University

Rankings assessed 1,904 universities from 108 countries and regions. They are the most comprehensive and rigorous rankings of their kind, evaluating research-intensive universities across 18 indicators related to teaching, research, global outlook and industry.

This year's rankings include five new metrics, four of which look at research quality while another examines patents in the industry pillar, to better understand universities' development of intellectual property.

The UK has three universities in the top ten, seven in the top 50, 11 in the top 100 and 25 in the top 200. Imperial ranked sixth for its international outlook, eighth for research quality, and 12th for teaching.

Professor Ian Walmsley, Provost of Imperial College London said: "Imperial continues to deliver world-changing research, teaching

and impact. All of this depends on exceptional people, and I commend our entire community for our shared achievements."

With 7 fellow top ten universities in the US, Imperial continues to strengthen its ties across the Atlantic – for example with a recent Presidential visit to San Francisco and the Bay Area including Stanford University (the top institution in the US, according to THE).

Imperial is also actively working with partners in Europe, Africa, Asia and North America to solve major challenges including climate change. For example, in May, Imperial and the University of Tokyo (Japan's top university, according to THE) announced a major new strategic relationship for cleantech and energy research, ahead of the G7 Summit in Hiroshima.

In September, Imperial announced it would be continuing a research partnership with the Indian Institute

of Science (India's top university, according to THE).

Whilst the latest THE ranking represents important recognition, Imperial places a clear focus on achieving enduring excellence in research and education for the benefit of society. Indeed, the latest rankings follow a series of achievements for Imperial over the past couple of years, including its best-ever results in the UK's Research Excellence Framework (REF) and a Queen's Anniversary Prize in recognition of pioneering work during the COVID-19 pandemic.

Earlier in the year, Imperial launched QuEST, which gathers world-leading experts in quantum science and engineering to develop technologies of the future – as well as the I-X initiative to tackle global challenges with artificial intelligence (AI) and data science.

<https://bit.ly/IE39-Rankings>

<https://bit.ly/IE39-DMRanking>

Central Library to be renamed Abdus Salam Library



Photo: Imperial College

Imperial's Central Library will be named the Abdus Salam Library in recognition of the Nobel Prize winning physicist.

Writing to Imperial's staff and students, President Hugh Brady

said: "Throughout his career, the Nobel Prize winning Professor of Theoretical Physics, **Abdus Salam**, made a tremendous contribution to Imperial, as well as to the world of physics and science more generally. It is right that we do more to celebrate this legacy. I hope the new Abdus Salam Library inspires many more people in the years to come."

Imperial's University Management Board decided to name the Central Library after Professor Salam as part of its ongoing response to the History Group's report. Published

last year, this report focused on Imperial's associations with historical figures and undercelebrated people from Imperial's past.

Recognising the contribution of academics like Professor Salam is a key part of Imperial's response to this report. Further work is underway to respond to its findings, including other initiatives to recognise undercelebrated individuals like Professor Salam, both physically around our campuses, through portraiture or through scholarships.

Professor Salam joined Imperial in

1957. During his time here, he set up the Theoretical Physics Group with the late Professor Paul T Matthews. He later shared the 1979 Nobel Prize for his contribution to the electroweak unification theory.

He was also a passionate promoter of science education in the developing world, founding the International Centre for Theoretical Physics in 1964 where scientists from developing countries would be able to come on a regular basis to interact with leaders in the field.

<https://bit.ly/IE39-Salam>

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

Imperial researcher wins Net Zero Award

Barney Shanks, a PhD researcher in Imperial's Department of Civil and Environmental Engineering, has won the 2023 Hawley Award for Net Zero Carbon Innovation for concrete that captures carbon.

The award, from the Worshipful Company of Engineers, is made for the most outstanding Engineering Innovation that delivers demonstrable benefit to the environment and will help to achieve Net Zero Carbon by at least 2050.

It recognises Barney's achievement, with fellow researcher and co-founder Sam Draper, under the supervision of Professors Hong Wong and Chris Cheeseman, in developing a novel carbon capture technology that produces sustainable alternatives to concrete. The pair set up their company, Seratech, in 2021 to commercially market their products.

Concrete is the second most consumed resource, after water, and is used throughout the world for commercial, industrial and domestic

construction projects. The binding ingredient in most concretes is Portland cement, which accounts for eight per cent of all global CO₂ emissions, so developing sustainable alternatives is a real priority.

The award comes just months after the two researchers won £1m of government investment for their new technology, which employs Carbon Capture, Utilisation and Storage (CCUS) to transform naturally abundant magnesium silicate minerals, such as olivine, into a range of sustainable construction products.

Barney said: "Winning this award is a real honour for myself and the team behind the research, and recognises the potential of our project to make a huge contribution to reducing global carbon emissions. We're very optimistic that Seratech products will be commercially available within the next few years."

Principal Investigator on the project, Professor Cheeseman, from the Department of Civil and



Photo: Mark Witter Photography

Environmental Engineering, said: "I am delighted to see Barney receive this recognition for outstanding innovation. Combining the production of a cement replacement material with carbon capture is a really innovative approach. Concrete is one of the most commonly used building products, and 90 per cent

of future production is forecast to occur in developing countries, so this technology has massive potential to decarbonise construction. Barney and Sam are great ambassadors of the innovation and enterprise that is core to our philosophy at Imperial."

<https://bit.ly/IE39-Concrete>

IOP Michael Faraday Prize



Professor Mark Oxborrow



Professor Neil Alford

Professors Neil Alford and Mark Oxborrow from the Department of Materials have been awarded the Institute of Physics Michael Faraday Medal and Prize as part of the team that developed the world's first solid-state room-temperature masers in pentacene and then in diamond. The team consists of six academics from Imperial, UCL, and the University of Northumbria.

A sister technology of lasers, masers are the ultimate amplifiers for weak microwave signals, boosting very weak electromagnetic signals

without contributing any additional noise. This is essential in fields such as radio astronomy, telecomms, and medical imaging.

However, until now masers have not had the same technological impact as lasers because it has only been possible for them to function in high magnetic fields within vacuums at cryogenic temperatures close to absolute zero – making them expensive and inconvenient to use.

The team's research resulted in the creation of the world's first room-temperature maser – which offers the benefits of low noise without the constraints and costs imposed by cryogenics.

This breakthrough has opened up many new applications for masers, including producing clearer and faster images in MRI machines, more sensitive magnetic resonance body scanners, quantum computer components, portable atomic clocks, and better radio astronomy devices for deep space exploration.

Professor Alford said: "I am absolutely delighted that the maser team has been awarded the Faraday Prize. It's testament to the superb contribution from all the team members in developing a thorough understanding of the physics, the chemistry, the materials science, and the microwave engineering required to make both the organic and the diamond masers work at room temperature."

<https://bit.ly/IE39-Faraday>

Nigerian Science Prize and presidential honour



Photo: Imperial College

Professor Hippolite Amadi, Imperial alumnus and now Visiting Professor in the Department of Bioengineering, won the Nigerian national Science prize, worth \$100,000 USD, for his solar-powered non-invasive neonatal ventilator (NIV) – now considered the gold standard in the care of premature infants with respiratory distress syndrome.

He was awarded the prize during a ceremony in Lagos on 13 October 2023. Judges for the prize said Professor Amadi's work had significantly advanced, and reduced the cost of, neonatal care in Nigeria and similar countries.

Professor Amadi said: "I am honoured to receive this award, but even more pleased to have helped improve access to effective

healthcare for unwell newborns in Nigeria and other low- and middle-income countries."

The President of Nigeria, Bola Ahmed Tinubu, commended Professor Amadi "for leveraging his extensive background in medical engineering and technology, with a special focus on affordable medical systems, for the betterment, progress, and benefit of Nigerians and humanity in general."

A statement from his office said: "This significant work by this great Nigerian scientist will contribute to keeping more Nigerian children alive after birth and preparing them for a better future as positive change makers and influencers both at home and abroad."

<https://bit.ly/IE39-Amadi>

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

New Fellows of the Royal Academy of Engineering

Ian Funnell, Chair of the Energy Futures Lab Advisory Board, has been made a fellow of the Royal Academy of Engineering. Five Imperial academics were also elected Fellows of the Academy: Professors Julian Bommer, John Dear, Stepan Lucyszyn, Bikash Pal, and Daryl Williams. In all, 73 leading figures in the fields of engineering and technology were elected to the Academy's Fellowship at its AGM this year. They will be formally admitted to the Academy at a ceremony in London on 28th

November and will lend their unique capabilities to achieving the Academy's overarching strategic goal to harness the power of engineering to create a sustainable society and an inclusive economy for all.

Sir Jim McDonald FREng FRSE, President of the Royal Academy of Engineering said: "In an uncertain world, one thing is certain – engineering skills, vision and leadership will play a crucial part in addressing the escalating domestic and global challenges that we face today. The combined connectivity,

professionalism, experience and wisdom of the new Fellows who join us today will greatly enrich the expertise and support we can provide to the government and to society in general."

The newly-elected members join 104 Imperial Fellows across 12 departments, bringing the total number of Imperial Fellows to 109. Professor Nigel Brandon, Dean of the Faculty of Engineering, said: "It is fabulous to see five of our leading researchers recognised in this way for their contribution to

the advancement of knowledge and understanding in their various engineering fields. Professors Bommer, Dear, Lucyszyn, Pal, and Williams are dedicated researchers – both within their teams and across their profession. Their fellowship of the Royal Academy of Engineering is well deserved. I offer each of them my personal congratulations on this great honour and achievement."

<https://bit.ly/IE39-Funnell>
<https://bit.ly/IE39-RAEFellows>



Ian Funnell is Chair of the Energy Futures Lab Advisory Board, and is also Chair of the National Nuclear Laboratory (NNL).

He has had a long and distinguished career in the global energy sector, having joined ABB in 1999, later serving as CEO of ABB UK and Hitachi Energy Ltd in the UK and Ireland. He has also held positions on the Made Smarter Commission, the UK Government's Advisory Board for Innovate UK (Energy Revolution) and the COVID Recovery Commission.

In addition to his roles at Energy Futures Lab, Imperial's global energy institute, and the NNL, Mr Funnell currently serves as Chair of the NG Bailey Group, advisor to the Chair of Hitachi Europe, and as an Ambassador of the Women Leaders Association.

Last year, he delivered the Energy Futures Lab Annual Lecture, discussing the future of nuclear energy in the UK and around the world in front of a packed audience at Imperial.

Mr Funnell said he was delighted to be elected a Fellow of the Academy: "There is a huge diversity of engineers who strive to address some of the world's most complex challenges – to benefit society and the economy in the process. I'm so glad I chose engineering as a career; it is an honour to be an engineer."



Professor Julian Bommer is a Senior Research Investigator in the Department of Civil and Environmental Engineering. He spent 17 years on the full-time academic staff in Imperial's Faculty of Engineering, serving as Professor of Earthquake Risk Assessment for five years from 2006. As Director of Engineering Studies, he launched a new four-year MEng curriculum in Civil Engineering in 2008.

His work began in the field of predicting earthquake ground-motions and analysing the influence of different features of earthquake shaking on buildings. His research has been strongly influenced by his participation in seismic hazard studies for critical infrastructure projects around the world, including dams, nuclear power plants, and the expansion of the Panama Canal.

Professor Bommer pioneered the 'backbone' approach for building ground-motion prediction models, which are now commonly used in site-specific seismic hazard assessments, and has extensively researched induced seismicity caused by activities related to energy technologies.

Professor Bommer said: "I am deeply honoured to receive this recognition for my work on natural and induced earthquake risk, and I am excited to become part of the Royal Academy of Engineering and the great work it does in promoting engineering solutions to the challenges faced by society."



Professor Bikash Pal is Professor of Power Systems in Imperial's Department of Electrical and Electronic Engineering. He pioneers research in power system stability, control, and computation and currently leads a six-university UK-China research consortium in Sustainable Energy Networks called ROSES.

Professor Pal is internationally known for innovations and engineering achievements contributing to the stability and control of power networks with renewable generation. His research, analysis and solutions have been adopted by Siemens, GE Grid Solutions, and others.

Professor Pal also founded and directed the MSc taught course in Future Power Networks at Imperial College London, and has held visiting professorships in Denmark, Germany and China.

He said: "I am very pleased that our research on wind farm stabilisation and power network state estimation has helped the electric power industry to develop tools and products which are in use in energy control centres in several countries. I am very grateful to my students and collaborators, as I am to the Academy, for this national honour for an engineer."



Professor Stepan Lucyszyn is Professor of Millimetre-wave Systems in the Department of Electrical and Electronic Engineering. Before qualifying as a chartered engineer and beginning his academic career, he briefly worked in industry, as a satellite systems engineer for maritime and military communications.

In 2010, he was awarded the DSc degree (higher doctorate) by Imperial for his contributions to millimetre-wave and terahertz electronics. In 2012, he co-founded the cross-disciplinary Centre for Terahertz Science and Engineering at Imperial and was its Co-Director until 2019.

In 2014, with Lord (Paul Rudd) Drayson, he co-founded the Imperial spin-out company Drayson Wireless Ltd. (later Drayson Technologies Ltd), being a co-inventor in two patent families associated with radiative and inductive wireless power transfer.

He said: "I am delighted that my broad spectrum of work in microwave engineering has been recognised by the Royal Academy of Engineering and look forward to contributing to the Fellowship."

Photos: Imperial College

DEVELOPMENTS AROUND THE ENGINEERING FACULTY



Professor John Dear is Professor of Mechanical Engineering and has been an academic for 35 years in the Mechanics of Materials team at Imperial's Department of Mechanical Engineering. During that time, he has supervised 66 PhD researchers.

Professor Dear leads in developing and applying innovative mapping techniques to applications including high-speed impact of composite structures for aircraft, structural health monitoring of critical engineering components for power stations, and blast resistance of laminated glass structures for landmark buildings such as the City of London's 52 Lime Street, (known as The Scalpel), and 100 Bishopsgate.

His research has led to well-validated models capable of predicting the different micro-mechanisms of failure in these structures. The type of mapping he developed, called speckle strain mapping, has been applied to components for the Ministry of Defence and blast resistant structures for the US Navy. His work helps us understand how composite materials and structures can fail under extreme conditions

Professor Dear said: "I am very pleased to receive this prestigious honour, of a Fellowship from the Royal Academy of Engineering, and I very much appreciate the help and support I have received over the years, from my friends and colleagues, at Imperial College London and all around the world. There has been a lot of interest recently in the structural integrity of materials for aerospace, marine, vehicle transport and building construction. The work my team and I do is designed to pick up any issues with materials at the design and pilot stage – before their failure becomes critical. The award highlights the significance and relevance of our work."



Professor Daryl Williams is Professor of Particle Science in Imperial's Department of Chemical Engineering and Director of the Discovery Space. He is internationally recognised for his expertise in particle engineering, and is the founder and Managing Director of Surface Measurement Systems. As academic lead for Imperial's Carbon Capture Pilot Plant he pioneers hands-on engineering teaching, outreach and research on climate change mitigation.

Working with leading global industrial partners, his research interests include the surface and bulk characterisation of complex particulate solids, as well as their manufacture, formulation and performance. His work also focuses on developing new instrumentation for characterising materials.

Professor Williams invented a new family of scientific methods for rapidly determining the moisture sensitivity of powders called Dynamic Vapour Sorption which has been globally commercialised by Surface Measurement Systems. These methods are now used by every major pharmaceutical company in the world and in more than 1,000 universities and research laboratories. The methods he devised have been incorporated into global standards, transforming industrial and research practice in the pharmaceutical, food, personal care and particulates industries.

During the COVID-19 pandemic, in a practical example of the vital role particle science plays in our everyday lives, he assisted the BBC Morning Live team by leading a study on the varying effectiveness of different facemasks in containing the spread of airborne breath droplets.

Professor Williams said: "Particle engineering has provided a fascinating backdrop to my career in research, commercialisation, and innovation, because it underpins everything from food production to carbon capture and pharmaceutical materials. I am absolutely delighted that my work in this area has been recognised by the Royal Academy of Engineering."

RAEng Research Fellowship



Photo: Imperial College

Dr Abigail Ackerman has been awarded a Research Fellowship by the Royal Academy of Engineering.

She is one of ten individuals from universities in the UK who were announced in August as recipients of the Royal Academy of Engineering Research Fellowships programme, alongside two additional Engineering for Development Research Fellowships. The Research Fellowships programme supports outstanding early-career researchers to become future research leaders in engineering.

Dr Ackerman will now hold the position of RAEng Research Fellow in the Department of Materials. She first joined the department as a Research Postgraduate in 2014.

In recent years, Dr Ackerman has collaborated with Dr Stella Pedrazzini and Professor Mary Ryan, researching corrosion in steel and nickel. Additionally, she has been investigating hydrogen behaviours in titanium alloys alongside Professor Baptiste Gault. Dr Ackerman also received the June Wilson Award and the Head of Department's fund for postdoctoral research in 2022.

Dr Ackerman's new project

will be titled '*Hydrogen and Seek: Understanding hydrogen in engineering alloys*'. The focal point of the project will be understanding the fundamental effects of hydrogen on materials and using that knowledge to improve sustainability in industry. This includes developing corrosion-resistant electrode materials for use in low-carbon electrolytic iron extraction and furthering the understanding of hydrogen embrittlement in materials such as titanium and zirconium. This research will be underpinned by the use of the new Imperial Centre for Cryo Microscopy of Materials and in support of Imperial College's Transition to Zero Pollution initiative.

Dr Ackerman said: "It is an honour to receive the support of both the Royal Academy of Engineering and Imperial College London to improve sustainability in materials science. It has become apparent that traditional materials production methods, particularly in steel making, do not support global climate goals, and I am excited to have the opportunity to make a tangible positive impact through this research."

<https://bit.ly/IE39-Ackerman>

AI Model Bias

An AI chest X-ray foundation model may not be fit for clinical applications due to racial and sex-related biases, suggests a new study 'Risk of Bias in Chest Radiography Deep Learning Foundation Models'.

The study, led by **Dr Ben Glocker** from Imperial's Department of Computing, aimed to assess the potential risks for using foundation models, which are trained on large datasets for many purposes, in the development of medical imaging AI tools.

To investigate any bias within the model, the researchers randomly sampled a set of 3,000 patients (1,000 samples each from three racial groups). Significant differences

were found between male and female and Asian and Black patients related to disease detection.

Dr Glocker said: "AI is often seen as a 'black box' – unexplainable in the way it works – but that's not entirely true. With the right tools, we can open the box and inspect its features to prevent bias from creeping in. Model inspection is one way of continuously monitoring and flagging issues that need a second look. The work doesn't start with the AI model, it starts with the data used to build it. As we collect the next dataset, we need to, from day one, make sure AI is being used in a way that will benefit everyone."

<https://bit.ly/IE39-XRayAI>

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

De-steaming towards Net Zero

South Kensington Campus is home to one of London's largest Combined Heat and Power (CHP) stations. The steam network in place is more than 60-years-old and the steam boilers 23-years-old – almost at the end of their expected 25 year life. The steam network interacts with almost all buildings on the South Kensington Campus. A bold project to remove a significant amount of the steam generating infrastructure has been onsite for almost a year. This project is part of the College's long-term goal to decarbonise the estate in line with the sustainability strategy. It is a very challenging project as it reaches most of the campus, but is crucial to ensure that we reduce our energy usage and therefore carbon emissions. The project consolidates three heat networks into one and College would no longer have 180°C steam in circulation around the campus and plant rooms. This will reduce the College's carbon dioxide emissions by circa 2,400 tonnes/year and save over £1.341m per year after implementation. It is key to assisting the College in achieving net zero carbon by 2040. The CHP generation part, of what are known as Scope 1 emissions, totals around 40,000 tCO₂e and therefore the percentage reduction of this would be 6%. In the process, College receives a new heat network and boiler systems. The works within the buildings have been broken into three 'batches' to try and minimise the disruption to the operation of the Campus. This news item offers an update of the current state of the project.

The College first installed CHP at South Kensington in 1999, one of largest in London. CHP is the simultaneous generation of useful heat and electricity, and the heat is a by-product of electricity generation. The electricity generated powers the buildings on the campus via a large 'private wire' high voltage network located in the tunnels beneath the campus, the heat generated being distributed around the campus via two heat networks; one steam based, the other water.

This system was replaced with a newer, more efficient system in 2015. Located under Electrical and Electronic Engineering (EEE) it consisted of five main components: two Jenbacher J624 gas CHP engines (4.5MW each), two waste heat & gas fired combination boilers and one gas fired only boiler, each boiler is circa 12MW total thermal output. These assets, ancillary equipment and immediate area where they are located is often referred to as the 'energy centre' now being upgraded.

The amount of electricity consumed on South Kensington Campus in 2022 was, roughly speaking, enough to power around 24,000 homes. That's something like the electricity needed for the town of Corby for a day.

That's a lot of power. Fortunately, we had our own onsite energy centre for more than 20 years which generated around 82% of that electricity. The waste heat from this used to heat buildings and provide



One of the three new boilers being installed in the energy centre

Photos: Imperial College

hot water. Highly efficient and quality ranked by the Government, it was saving around £6.6m in utility costs and more than 3,500 tonnes in carbon emissions.

Despite that, we knew we could do more to reduce our carbon footprint and help College become a more sustainable energy consumer.

To move the College towards decarbonisation and improve the efficiency of our heat generation and district heating network, the College started work on its de-steaming project to remove central steam generation.

It would be hard for anyone to be on Campus and not see evidence of the major project underway to transform the Combined Heat and Power plant (CHP), reducing our energy use, carbon footprint and associated emissions.

Whether the blue hoardings decorated with information about the project surrounding the work areas, or the enormous temporary flues and ductwork running up outside buildings, or back in the summer the three new boilers lined up ready for installation, looking like something ready for a NASA

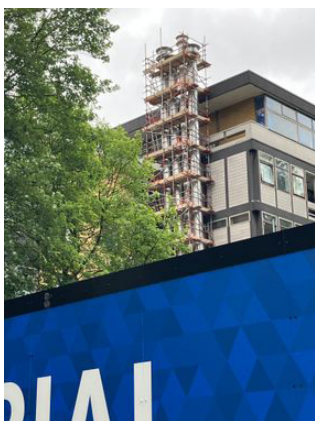
launchpad, the signs are everywhere. Hard to avoid, disruptive? Maybe. Equally, as the saying goes, you can't make an omelette without cracking eggs.

Funding allowed this major project to be undertaken in one go, although broken down into smaller packages, which also reduces the pain and disruption to a limited timeframe.

Unexpected challenges to the installation programme mean some of that pain might be caused by temporary interruptions to heating and hot water in specific areas,

and some slightly cooler than usual temperatures on occasions. We are working hard to mitigate this, notify those directly affected, and keep everyone informed, and ask them to bear with this important programme.

Temporary steam and Low Temperature Hot Water (LTHW boilers), supported by local boilers, will supply the heat throughout this winter. A switch-over to the new boilers will happen around the start of 2024 in a managed way.



A temporary flue in place outside Skempton building



DEVELOPMENTS AROUND THE ENGINEERING FACULTY

Where the project is now

Three new boilers were delivered to campus in August. Such was the size of the delivery load that it had to be escort-routed through London. Although factory assembled by the manufacturer, Cochran, they were stripped back down for delivery, the ancillary parts arriving separately to be reassembled in situ by Cochran in conjunction with contractor Vital Energi.

The energy centre was completely stripped out in preparation for the new arrivals, made possible once the temporary boilers and flues had been installed and commissioned, part of the project undertaken through the first part of this year.

First to go in, to the left, was boiler one, Tom, 12MW, weighing 40.9 tonnes when empty and 71.9 tonnes when operational. This was followed to the right by the same sized boiler number three, Dick. Boiler two, 10MW Harry, weighing just 35.1 tonnes when empty, 56 tonnes when operational, is in the middle. The sequence allowed systematic working and access.

New pipework is being installed, pressure testing is taking place, insulation going in, followed by electricals and controls, as well as safety coating and sealing the environment.

The aim is to complete this phase before Christmas.

While this is going on, further packages of work are being carried out. These include replacing pipework within buildings, heat exchangers and coils with air handling units as well as associated controls that link back to our building management system.

The background

In 2022, the College was awarded a Public Sector Decarbonisation Scheme grant of more than £12m which contributed towards the £40m cost of this project.

For several decades, heating and hot water for the buildings on South Kensington Campus came from two distinct heat networks, a heated water network and a steam network. Neither had enough heating capacity to replace the other. However, with the College's Net Zero 2040 ambitions something had to be done, as operating two heat networks is inherently wasteful and inefficient. With only relatively small demands for steam this could be replaced with heated water, making it possible to remove the steam and condensate heat networks.

Works

The work being undertaken is in places complex but can be broadly



Pipework in the combined heat and power plant

broken down in to four categories:

- The work currently in the Energy Centre: Removal of three large and end of life 12MW steam boilers and replacement with three new Cochran 10MW water boilers with integrated heat recovery units, these recover the heat from the CHP engine's exhaust. Other steam infrastructure is also being removed such as a large water treatment plant and chemical treatment equipment.
- Tunnels and heat network: the steam and condensate heat networks are being removed and in places the heated water network pipes are being replaced with larger, higher capacity pipes, which can carry more heat through them.
- Plant rooms: steam heat interface units in plant rooms used for heating or hot water are being replaced with new systems to provide services to the buildings from the heated water district heat network.
- Buildings: there are some systems in the buildings that require steam such as air handling units, these need to be modified to receive heated water instead of steam.

Benefits

The benefits of the works are significant:

- The new boilers are much more efficient that the old ones increasing from 79% to 87% efficiency, 8% more efficient than the old ones in converting natural gas to useful heat. It might not sound much but it has a significant impact. They also 'extract' more

of the waste heat from the CHP engines thus making the system significantly more efficient than previously. These efficiency savings are expected to save the College over 2,400 tonnes of CO₂ per annum.

- The removal of the steam and condensate networks, although much harder to quantify should result in significant reductions on the thermal demand of the campus.
- Inherent safety benefits of not circulating 180°C steam; no longer having to comply with pressure systems regulations and having replaced plant with new which will be more reliable and have higher availability.
- A significant reduction in NOx emissions, associated with poor air quality and respiratory conditions. This is currently being quantified and opens the possibility in the future to doing further work to further reduce NOx emissions.

Next phase

The next phase of the project will involve finishing the installation of all the pipework, heat exchangers and heating coils before fully commissioning the system and associated controls before it is handed back to the College and the temporary boilers are removed in early 2024.

Long-term

The strategy is to move the whole of the South Kensington Campus to a low temperature hot water system running at 80°C in preparation for further heat decarbonisation.

A Net Zero Strategy is currently under development to develop a programme and associated costs up to 2040.

Wisdom is that we should reduce heat and electricity demand as much as reasonably practicable first, then look at low carbon ways of delivering the demands. The Net Zero strategy will help join up these plans.

SKZen

The College is one of 22 leading cultural and educational organisations in South Kensington in the Exhibition Road Cultural Group (ERCG) working with South Kensington Zero Emissions Nature Positive (ZEN+) Programme. This is an innovative neighbourhood response to the climate and biodiversity crisis. It been awarded £120k of GLA money to further explore options and viability of a number of schemes including making use of heat from ground water in Princes Gardens.

<https://bit.ly/IE39-CHP>

If you want further information about the project, updates on progress, along with a downloadable status document which is updated regularly, go to the College Estates webpages:

<https://bit.ly/IE39-Desteaming>

Misunderstanding mining

We are delighted to be able to present the RSMA Illing Family Essay Prize winning entry, by Rebekah Parry (ESE2). Rebekah is entering her 3rd year studying Earth and Planetary Science with a Geophysics focus. She is interested in both science communication and the space industry. She won £200 and a miniature miners lamp!

The mining industry has a PR problem. ‘Big mining’ is thought to be driven only by profit, with total disregard for the environmental cost. It is left, so the story goes, to everyday people and environmental activists to protect the planet from this greed. Certainly, mining companies must be held accountable for human rights violations and unlawful environmental destruction. The mistrust of the public is not without cause. There is, however, a misunderstanding in the public imagination, particularly from the perspective of the well-intentioned environmentalist, concerning the nefarious role of mining in the climate crisis. There must be a significant reorientation of the public sentiment surrounding the relationship between climate action and traditional mining. Far from destroying the planet, the industry plays a crucial role in preventing its destruction. Without significant quantities of mined critical minerals, the renewable technology revolution cannot happen.



Everyone knows we need to move from fossil fuels to renewable alternatives, such as solar panels, electric vehicles, and wind turbines. The enormous quantities of critical

minerals these technologies demand, however, is far less well recognised by those outside of the industry. Consider the mineral demands of power generation. Using natural gas, 1100kg of copper and 48kg of chromium are required per megawatt of power generated. The quantities of minerals required to generate offshore wind power are in a completely different league. Via offshore wind, 8000kg of copper, 240kg of nickel, 790kg of manganese, 525kg of chromium, 109kg of molybdenum, 5500kg of zinc, and 239kg of Rare Earth Elements (REE) are needed to generate the same amount of power (IEA, 2022). Other renewable energy sources are similarly demanding. The uncomfortable reality is that renewable forms of power generation, including onshore wind, solar panels, and nuclear power, are just more mineral-intensive than coal and natural gas. Mining industry voices add an inconvenient yet vital nuance to the renewable energy conversation.

Alternatively, consider the poster product for green technology – the electric car. While a conventional car requires approximately 22kg of copper and 12kg of manganese to produce, an electric car requires at least twice as much copper and manganese at 53kg and 24kg respectively, alongside an additional 9kg of lithium, 40kg of nickel, 13kg of cobalt,



Bucharest protest against Rosia Montana gold mine expansion, 15 September 2013

Photo: Bogdan Găușca / CC-BY-SA 1.0

could cost us the Earth

66kg of graphite, and 0.5kg of REE (IEA, 2022). Whilst lists of minerals do not make a thrilling read, they have startling implications. In any case, copper demand is predicted to quadruple by 2050 (Mackay, 2022). Unprecedented increases in demand are also expected for cobalt, nickel, and lithium. To meet global demand while switching to eco-friendly technologies, we need to mine a lot of minerals.

In light of this looming crisis, we could expect environmentalists to be imploring government support for the mining industry endeavouring to meet this demand to enable the large-scale implementation of green technology. In reality, mining projects often meet significant public resistance. In Serbia in 2021, thousands took to the streets to protest a new government-backed lithium mine (France-Press, 2021). In the same year, protestors in Northern Ireland marched against a proposed gold mine. Locals raised valid concerns about pollution of the natural environment, but also expressed a determination to “stop this toxic industry” (Green News, 2021). These objections transcend the specific issue of a gold mine in Greencastle. They exemplify negative public sentiment towards the industry as a whole.

Perhaps these examples are simply evidence of NIMBY-ism (Not In My Back Yard) in action. But that possibility seems less credible when we consider the public reaction to the prospect of deep-sea mining, which does not encroach on anybody’s “back yard”. Some propose deep-sea mining as the solution to our critical minerals needs. The ore grades found on land are ever-degrading, thanks to humanity’s long history of digging. But on the deep ocean floor, surrounding hydrothermal vents, we find potato-sized nodules of manganese, nickel, and cobalt (Greenpeace, 2023). These higher-grade deposits are a tempting alternative to navigating the remaining, increasingly complex, terrestrial deposits. They have the added bonus of being far away. Nonetheless, deep-sea mining is extremely controversial, fiercely resisted by environmentalist organisations like Greenpeace, Ocean Rebellion and Extinction Rebellion. The ethical debate surrounding deep-sea mining is a topic deserving of its own essay. The large-scale destruction of ocean habitats is a danger that cannot be ignored. Here the reference to deep-sea mining illustrates that resistance to mining is not only the reserve of disgruntled locals, but part of a general distaste for the mining industry permeating public environmental activism.

Opposition to mining companies is not always unwarranted, and environmentalists should not be vilified just because they oppose mining operations. Throughout 2013, street

protests in Bucharest and Budapest opposed the expansion of the Rosia Montana gold mine which would utilise large amounts of cyanide in the mining process (European Greens, 2013). It is difficult to argue that the contamination of rivers with cyanide, a textbook environmental tragedy, can be justified by the demand for gold required for solar panels. Similarly, in 2022 Norwegian activists resisted construction of a mining facility on the shores of the Fordefjord, when Nordic Mining had gained permission from the Norwegian government to deposit 250 million tonnes of mining waste in the pristine fjord (Friends of the Earth Europe, 2022).

The mining industry needs to be held accountable for upholding best practice in environmental principles, to avoid such disasters as referenced above. Mining operations must minimise pollutant release and reduce water and energy use as much as possible. Funding research to continue innovating mining processes to this end is essential. Bioleaching is being pioneered in Germany, using microbes to extract metals from low-grade ores without the need for harmful chemical leaching (Zhang et al., 2020). The Advanced Mineral Processing Research Group at Imperial is conducting research into dry mineral processing techniques which could significantly reduce water use in the sector (AMPRG, 2023). Maximising material reuse and recycling is also critical. In Finland, practitioners have found that mining tailings contain significant quantities of metals, which can be recovered using available technologies (Kinnunen et al., 2022). Best environmental practice calls for mined land to be rehabilitated to make it safe for wildlife and habitation, returning the land to its natural state wherever possible. Mining companies must embrace this final stage of the mine life cycle as an essential mediation to reassure the public that mining can be approached sustainably. Cultivating partnerships with local communities could be an effective way to demonstrate the industry’s commitment to this repair process.

At the root of the problem, however, is the need to address a communication breakdown. Mining is not going anywhere, and indeed it cannot, if the climate crisis is to be abated by renewable technology. Mining companies, government stakeholders, and environmental leaders must instigate a shift in attitude. Dumping cyanide in rivers and mining waste into fjords must be consigned to the past. It is a mistake, however, not to see the wood for the trees. We need a more nuanced understanding of the relationship between mining and environmental impact. The continuing habitability of our planet depends on it. We must minimise the potentially devastating

local environmental impact of mining, while embracing its crucial role in fighting climate change. There is no damage-free option. It seems environmental damage must prevent environmental destruction. We can only be smart in mitigation.

Reference list

- AMPRG (2023). *Research*. [online] Imperial College London. Available at: <https://www.imperial.ac.uk/earth-science/research/research-groups/amprg/research/> [Accessed 14 May 2023].
- European Greens (2013). *Greens protest Rosia Montana Gold mining project*. [online] European Greens. Available at: <https://europeangreens.eu/news/greens-protest-rosia-montana-gold-mining-project> [Accessed 14 May 2023].
- France-Press, A. (2021). *Rio Tinto lithium mine: thousands of protesters block roads across Serbia*. [online] The Guardian. Available at: <https://www.theguardian.com/world/2021/dec/05/rio-tinto-lithium-mine-thousands-of-protesters-block-roads-across-serbia> [Accessed 15 May 2023].
- Friends of the Earth Europe (2022). *Young activists ready to stop mining facility to save Norwegian fjord*. [online] Friends of the Earth Europe. Available at: <https://friendsoftheearth.eu/news/young-activists-ready-to-stop-mining-facility-to-save-norwegian-fjord/> [Accessed 14 May 2023].
- Green News (2021). *‘We will stop this toxic industry’: Protesters march against mining*. [online] GreenNews.ie. Available at: <https://greennews.ie/mining-protest-northern-ireland/> [Accessed 15 May 2023].
- Greenpeace (2023). *Deep sea mining: what it is, how it works, and why it’s risky*. [online] Greenpeace UK. Available at: <https://www.greenpeace.org.uk/challenges/deep-sea-mining/> [Accessed 15 May 2023].
- DEA (2022). *The Role of Critical World Energy Outlook Special Report Minerals in Clean Energy Transitions*. [online] Available at: <https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf> [Accessed 15 May 2023].
- Kinnunen, P., Karhu, M., Yli-Rantala, E., Kivikyto-Reponen, P. and Makinen, J. (2022). A review of circular economy strategies for mine tailings. *Cleaner Engineering and Technology*, 8, p. 100499. doi: <https://doi.org/10.1016/j.clet.2022.100499>.
- Mackay, I. (2022). *Minerals for the Energy Transition*.
- Zhang, R., Hedrich, S., Romer, F., Goldmann, D. and Schippers, A. (2020). Bioleaching of cobalt from Cu/Co-rich sulfidic mine tailings from the polymetallic Rammelsberg mine, Germany. *Hydrometallurgy*, 197, p. 105443. doi: <https://doi.org/10.1016/j.hydromet.2020.105443>.

SUNRIDERS

France – Singapore by Bicycle

365 days – 19,600 km – 21 countries

Between April 17 2022 and April 17 2023, two postgraduates, Damien Calvet (Mech Eng 2020-21) and Matthieu Marlin travelled from France to Singapore by bicycle. As well as being an exciting once-in-a-lifetime experience at the end of their studies, before starting a full-time career, they also planned to create a lasting record in the form of a book and a film. Beyond that, they saw the opportunity to share the joy of their adventure by working with a children’s hospital in Nice (where Damien was born) and a French association that connects travellers with hospitalised children. The social distancing restrictions imposed because of the Covid pandemic had been especially hard on children in hospital, for whom many other activities had also been cancelled. Damien and Matthieu hoped that regular contact with the children during their journey would be exciting for them to follow the two cyclists’ progress and track where they were. They raised additional funds for the trip by sponsorship, crowdfunding, and grants including from the Imperial College Exploration Fund and the Old Centralians’ Trust. At the end of their trip, they submitted a short report upon which this article is based. More photographs and details of their forthcoming book and film are available on their social media (@the_sunriders on Instagram)

Who are we?

We’re both 25, and it was in Singapore (2019) that we first met during an internship. Neither of us had any cycling experience whatsoever, yet two years later we set ourselves the crazy challenge of going back, but this time by bike!



All photos: @the_sunriders

Damien Calvet

After an Engineering Diploma at the Ecole Centrale de Lyon, Damien graduated from Imperial with an MSc in Sustainable Energy Futures.

Before the trip, Damien performed a “Tour de France” by bicycle. 3500km during the 2020 summer.

For this trip, Damien was in charge of the GPS and the medical supplies.

Matthieu Marlin

Matthieu graduated from Neoma Business School in Reims with an MSc in International Marketing and Brand Management.

Before the trip, Matthieu performed a 1000km bicycle trip in Switzerland in the 2020 summer.

Matthieu was in charge of the finance for this trip.

Itinerary

The overall itinerary was planned before the trip. Regarding the specific routes, we decided on a daily basis what roads to take using Google maps or the app Komoot. Komoot has been very helpful in remote areas because you can download the route and thus have access to it without internet.

Food and accommodation

We slept most of the nights in our tent. We booked hotels only when we were in cities and it was not possible to camp. Regarding food, we had our stove so we cooked most of the time. Otherwise, we bought food in small restaurants especially in Asia where food is quite cheap.

Visas

Online visa: Iran, India, Laos.
Directly at the border: Cambodia.
Others: not needed with a French passport.

Flights

Teheran (Iran) to Aktau (Kazakhstan) because Turkmenistan was closed (Covid).
Kolkata (India) to Hanoi (Vietnam) because Myanmar and China were closed (Covid).
Singapore to France (flight back).

Risk assessment

Our sponsor, ACS Assurance, provided us with 12 months “Globe Traveller” insurance. It gave us access to high medical expense coverage: 100% of the cost up to €150,000. It also covered: cost of travelling back in case of emergency, cost for rescue, cost of sending medicine that doesn’t exist in a country.



The road from Europe to Asia is commonly called the Silk Road. It is a very popular route for bike travellers. Every year hundreds of travellers head East. Based on the experience of other travellers, such as Martijn Doolaard or Jordy Jouan, it's known that one year is enough to finish the trip. Although other travellers' experiences can give some inspiration, we still wanted to check that our route would be safe. Several factors were considered: a) Political situation, which can evolve quickly – we stayed informed via the website of the French ministry of foreign affairs, which identifies areas to be avoided. b) Geography, the main obstacle is the Himalayas, so we avoided crossing them. c) Climate, which is the factor that made us decide on the direction to cycle – the two most important aspects that can impede travel are cold and rain. The rainy season in SE Asia starts around May. If the trip started from there, we would be cycling there during the worst season. The coldest region would be the high roads in Central Asia – in December/January the temperature can reach -10/ -15 at night. Starting from Europe, we would reach the region by October whereas, in the other direction, it would be reached in the middle of Winter. For these two reasons, it was clear we should travel from Europe to Asia.



Risks that we identified (and precautions against them):

- Snake bite / Scorpion bite
 - Wear long clothes when setting up camp
 - Never lift a rock
 - Close tent at night
 - Check clothes before putting on
 - Check bed sheets before getting in

- Meeting a wolf in central Asia
 - Ask locals about recent wolf activity
 - Watch for signs of wolf activity
 - Never travel alone
 - If encounter, stay calm, look in the eyes
 - Step back slowly, never turn your back
 - If aggressive, speak loud, throw rock
 - Climb rock or tree, never run

- Meeting a tiger
 - Avoid tigers' territory
 - Never travel alone
 - If encounter, stay calm, look in the eyes
 - Step back slowly, never turn your back
 - If aggressive, speak loud, throw rock
 - Climb rock or tree, never run

FEATURES

- Lost in the countryside
 - Always keep road in sight
 - Avoid riding at night
 - In addition to GPS, have paper map
- Dehydration
 - Drink at least 3 litres of water a day
- Sunburn
 - Wear protective layers
 - Wear sunscreen, lip balm and sunglasses
- Bike crash (with another vehicle)
 - Use light when sun starts to go down
 - Be careful at road junctions
 - Wear a helmet
 - Let aggressive drivers pass
 - Listen to cars
 - Be proficient with medical kit / first aid
- Bike crash (on the ground, on rocks)
 - Wear a helmet
 - Control the speed
 - Step down from bike if path too difficult
- Tent breakage
 - Follow tent set-up instructions
 - Check ground surface will not harm tent
 - Choose places protected from wind
 - Carry repair kit
- Flat tyre
 - Carry 2 spare tubes and 1 spare tyre each
 - Carry repair kit
- Chain breakage
 - Carry spare chain pieces and repair tool
- Small bike breakage
 - Bikes made from repairable material
- Big bike breakage
 - Ride on decent roads if possible
 - Park bikes so they do not fall
 - Don't overload bikes
- Theft of equipment
 - Hide sensitive material, carry with us.
 - Secure bikes when stopped.
 - Bikes have embedded GPS chip.
- Making a fire that gets out of control.
 - Use a camping stove instead of a fire
 - Never leave fire unattended
 - Have water or sand ready nearby
- Tent fire
 - Keep tents away from heat source
 - No cooking inside tents

Environmental impact

One of the reasons the bike was chosen as the means of transport for the expedition is its minimal environmental footprint. The trip followed the “Leave no trace” philosophy and the guidelines from Earth Watch International were followed.

For body and dish cleaning, an Alep Soap, which is a 100% natural product, was used. Human solid waste was buried far from water sources. Likewise, human and cleaning liquid wastes was disposed of at more than 100m from water sources. To minimise plastic waste, reusable food packaging was carried.

Food and water supply

As our progress solely depended on the energy provided by our legs and consequently on the number of calories taken, food supply was considered very carefully. About 4000kcal were required daily. The ease of transport of food was also considered. Grains, cereals, and nuts provide ease of transport and high energy value at the same time. They were the main source of energy. Sugar and vitamin intake was ensured by fruits and dry fruits daily.

To cook the food, fuel was required. To avoid any risk of wildfire, we prioritised gas and oil boilers instead of handmade wood fires. The Primus Omnifuel boiler is a tool that accepts any type of car fuel, unlike a camping gas boiler for which the refuel bottles might be hard to find in remote places. The Royal Geographical Society Expedition Handbook indicates that 0.33 litres of petrol will be needed per day. Refuelling was made in petrol stations.

Water in the countries we crossed was not always potable. Yet, to stick with our environmental philosophy, we wanted to limit the number of plastic water bottles bought. To cope with this issue we carried a UV water purificator. This tool, no bigger than a big Swiss knife can kill 100% of bacteria and viruses in one litre of water in 40 seconds.

Cycling equipment

Both of us rode the same model of bike: an Ellipse Bike M1. Ellipse Bike is a French bike brand. To promote their new bike, they agreed to give us one bike each. This is a gravel bike designed for mixed paths. The bike embeds 2 front and backlights, powered with an integrated dynamo in the front wheel. The dynamo can also charge all the electronics equipment thanks to a USB cable already connected to the generator.

To increase comfort, a leather seating Brooks B17 was chosen. It is a reference for long term bike travellers. The advantage of leather seating is that after a few kilometres, it adapts to the morphology of the cyclist for maximum comfort.

The bikes were equipped with four bags each: 2 of 20 litres on the back and 2 of 15 litres on the front. It enables an optimal spread of the weight to keep a good balance.

We used automatic bike shoes. They have the advantage of improving pedalling efficiency by 30% and considerably reduce the risk of tendonitis. However, this solution is constraining in cities, where we often started and stopped. This is why we also brought light shoes for days in cities or when we were not cycling.

We built a strong relationship with Ellipse Bike, which is managed by 3 young professionals. They agreed to provide our support on the bike equipment: if any piece of the bike suffered damage and needed to be changed, they agreed to send us the pieces by mail in whatever city we were in.

Clothing

Most of the route was in a hot or temperate climate. To protect from the sun neck protection was worn below the helmet on sunny days. Likewise, long sleeve T-shirts were preferred during summer. Sunscreen was also carried all the time.

To protect from the rain, synthetic insulation was used. Dry clothes are necessary for good hygiene and rest. Hence, we carried

equipment able to protect the whole body. A jacket for the top, special pants for legs and special water repellent shoe covers. To be able to cycle for hours under rain and remain dry, the top quality Gore-Tex technology was chosen.

The temperature did not go below zero. Still, being well insulated for a fresh evening was important. To protect from the cold the technique chosen was the addition of layers. A breathing layer first, close to the body. Then a comforter creates volume, which creates the insulation. Finally a wind-protective rigid layer.

Tents and sleeping

As we would be spending one full year together, getting along well was essential. We decided to take two tents. That way, each of us had his privacy area and would feel less fed up with the other.

Tents are the place for rest which we knew would be key to our success. Also, we decided to invest in top quality mattresses (from the brand Nemo), insulated from the ground, comfortable and that doesn't make noise when moving on them.

Communication

We each carried a two-way radio to be able to chat even when not standing next to each other by bike.

To communicate with family and friends prepaid sim cards were purchased when arriving in each country.

For emergency, a Spot beacon was taken. It is a satellite device able to send coordinates to the rescue service of the country and programmed contacts.

Training

Both of us keep an overall high level of fitness. The training during the six months preceding the departure consisted of swimming, jogging, gym and cycling. Additional weekend cycling training together was also performed.

During those six months, Damien stayed in Lausanne in Switzerland and Matthieu in

Dijon in the East of France. These two cities are situated two hours apart by car. It enabled us to meet regularly to perform joint training.

The training consisted of real conditions days and nights of cycling. We used the real equipment of the trip (bikes and tents) to test its situation. The training consisted of two days of cycling in the countryside of France or Switzerland and a night spent in the tent.

The landscape in the regions between the two cities is mostly made of mountains. It enabled us to make sure the speed ratios available on the bike are well adapted to any situation (fast going down and slow going up).

The bikes were available from November, which left 5 months to train with them. To get enough joint training, it was decided to meet once a month for these weekends. However, snowfalls can hamper the possibilities to train in mountains in altitude, so we planned to enjoy as many goodweather conditions as possible by performing two pieces of training in November and in the high regions of Switzerland. Then depending on the snow conditions, we planned that the training would gradually happen closer and closer to Dijon, less subject to snow.

Those weekends were also the opportunity to become comfortable with the use of bivouac equipment such as the tents and the cooking equipment.

First Aid Training

Both of us needed safety training to get sufficient skills in case of an accident. We performed a day-long training session in December in France. This was a safety training module called PSC1, which provided the actions to take in case of:

- Faintness
- Open wounds
- Burns
- Trauma
- Bleeding
- Airway obstruction
- Passing out
- Heart attack

Both of us were fully vaccinated against COVID-19 and had been to a specialised travel health centre to collect information on recommended vaccines, which were taken before departure: Yellow Fever, Hepatitis A, Typhoid, Japanese Encephalitis and Rabies.

As we would at times be in the countryside far from help, we took a full medical kit including antibiotics, burn spray, sunburn cream, antiseptic wipes, cotton wool, crepe bandages, a dental kit including temporary filling material, steri-strips, suture kit and local anaesthetic, zinc oxide tape, painkillers, rehydration sachets, nasal spray and Strepsils.

Making a film

Over the year, we've been extremely surprised by the support we've received. More than 10,000 people around the world have shown their interest in following us every day, and the energy our adventure has brought them.

So we realized the impact we can have, and decided to make an hour-long film. Our aim is to share the extraordinary human, sporting and personal experiences we've had, and to inspire others to set off on their own adventures.

Damien had invested in a high-quality camers, and we also took a drone and a GoPro to put on our bikes.

Writing a book

How do you get invited to an Uzbek wedding? What does a Kazak hammam look like? What do you think about when you spend 6 hours on your bike every day?

Such a journey leads to experiences, thoughts and situations, each more incredible than the previous one, that are impossible to capture in a single hour-long film. We've therefore decided to write a book centred around photography, which will complement the film by allowing us to dig much deeper into our thoughts and discover more about our daily lives through anecdotes that are often thrilling, sometimes funny and sometimes moving.

FEATURES



Day 69 – The famous hot air balloons of Capadocia. A magical show that was worth having to get up at 4am.



Day 87 – Tabriz, Iran. Ali is a farmer who we met while we were looking for a shady place to take a break. he could not speak English nor read, so we abandoned Google translate. We shared a tea with him. In spite of the language barrier we managed to communicate a little with gestures and we laughed a lot



Day 109 – South West Kazakhstan. What a unique feeling to cycle in the middle of nowhere, a huge endless road in front of us and nothing else around!



Day 149 – Kyrgyzstan. As we go into the Kyrgyz mountains we continue to wonder at the landscapes. We expected to find mountains covered with grass but were surprised at the aridity of the vegetation. Like being in a desert. It is splendid.



Day 150 – Kyrgyzstan. We had to abandon tank tops and put on padded jacket and parka. At 3000m altitude, it is cold.



Day 151 – Kalmak Pass. 3447m altitude, this was our biggest climb of the trip and put an end to our high altitude adventures. Downhill to the valley offered us a magnificent view through the mountains. A very nice way to end the amazing few days around Song-Kui Lake.



Day 276 – Laos. Today we reached the 15,000 kilometres milestone in our trip.



Day 298 – Thailand. There are Buddhist temples everywhere. The monks are always extremely welcoming and kind. With the heat and increasing humidity, we ask for hospitality in the temples in order to have a good shower.



Day 316 – Here we are hitting the Malacca peninsula, the last piece of land, very thin, which symbolically draws the last straight line towards our arrival in Singapore. Going along the coast peacefully, we start this last chapter with total serenity.

Conclusion

A taste of ADVENTURE

We came back home with a true feeling of achievement. In fact we did get what we wanted when we started this trip: Adventure! Being far from home, outside your comfort zone, forced to adapt all the time, to push your body and your mind to their limits. We absolutely loved it and it only motivated us to do more such adventures in the future.

A GREAT Friendship

Doing such a journey in pairs is not always easy but we succeeded in putting communication in the centre of our relationship. Thus, the journey went incredibly well and we plan to continue travelling together by bicycle in the future.

A new way of travelling

It was the first real long term experience travelling by bicycle and we have to say that we fell in love with this way of travelling. Being able to get into secluded areas and meet people more easily, is what we love about it. On top of that, given our environmental conscience, we feel this is the best way to travel for us.

Recommendations

Take the time to really prepare your trip. We spent one year preparing this adventure (equipments, visas, vaccine...) and that is why everything went smoothly.

Acknowledgements

Thank you to all of our sponsors:

SunRiders was officially sponsored by various companies that provided financial help and/or pieces of equipment, including:

Sports-Aventure, an outdoor sports shop in Bordeaux.

Menton Santé, a shop for health equipment.

ACS Assurance, an insurance company.

Ellipse Bike, a French bike brand.

Groupe CB, a company working on rock mining in the north of France.

Chef de File, a French company making stylish cycling clothing.

Optique Alcazar.

DPB Développement.

Biomedal

Signatures, partenaires des crus d'exception.

We also received grants from the Imperial College Exploration Board and the OC Trust.

To find out more

For more information, and to see more photographs of the trip, as well as various videos, and details of the book when it is published in December, please check out our Instagram page @the_sunriders.



The Litter-al Truth

Jim Platt (Mining Geology 1957-60), who lives in The Netherlands, wrote to tell us about Lilly’s Plastic Pickup, an endeavour especially close to his heart because the eponymous Lilly is his granddaughter.

The word ‘Litter’ can have a number of meanings depending on the context – the definition relevant to this article being :

- *Things scattered about, scattered rubbish*
- *A condition of disorder, or untidiness*

‘Things’ is of course a blanket generalisation, but in the conventional understanding of what is regarded as litter, such ‘things’ all too often lead back to the irresponsibly discarded residues of human activity both individual and social.

The act of littering, which usually tends to be more deliberate than accidental, is a blight on orderly society, deleterious to the natural environment, a hazard to wildlife and a threat to the future owing to its follow-through impact on oceanic pollution, global warming and climate change.

Littering isn’t a new phenomenon. It is just that it has grown to become an ever-greater integral blot on the land as the range of consumer products and their outlets have burgeoned, thereby providing more grist for the littering mill of the usual suspects.

Certain popular brands of soft drinks and fast food constitute a well-defined and widespread sector of the litter inventory, and come in for a very large share of unjustified criticism. The manufacturers are in no way to blame for the incidence of their products seen lying strewn in the public domain. The culprits are the consumers, litter-tossers unencumbered by any sense of social responsibility or of accountability for their actions, or any regard for the consequences of littering in both the short and the long term, or norms of human decency. For them, a public refuse disposal bin is an artifact to be either ignored or wrecked, a glass bottle is an object to be satisfyingly smashed into a multiplicity of pieces on ground used by the public, plastic beakers are toys to be shredded, paper exists to be torn, scrunched and scattered at large.

In the year 2016, Lilly Platt, my granddaughter, then aged 8, motivated by concern over the incidence of plastic and other litter in her local town and its environs, and learning of its flow-through contribution to the planet-damaging oceanic plastic soup, decided that she wanted to do what she could by tackling plastic litter at its source, thus preventing it from entering the terrestrial-water drainage system and reaching the ocean, harming wildlife there and on its way.

She named her project “Lilly’s Plastic Pickup”, an endeavour to pick up regularly and lead by example, trusting to motivate others to do the same thing. “Lilly’s Plastic Pickup” can be referenced on all the principal Social Media channels. The project has



Lilly and Jim

received a number of awards, including Lilly’s Ambassadorship of the Plastic Pollution Coalition. She has attended and spoken at several relevant international conferences, in Canada, Scotland, Norway, Italy and the European Parliament.

My part in Lilly’s project is vested in full support for her, focussing on the pickup activity, which, over the past several years has evolved into a gladly undertaken daily activity for me. We participate in various pickup events when they take place and aim, to the maximum extent that it is possible, to open the eyes of the very young to the threat that littering poses to their future. No contribution to cleaning up is too small not to make a difference. If everyone could pick up and properly dispose of three items of plastic litter per day, how great would that be for the world! “Many a mickle mak’s a muckle”.

We see education as vital, to raise awareness of the problem and its solution at the earliest age, as by so doing a generation could rise that will truly care for its environment, seek Climate Justice, and respect nature in a way that certain factions of the current generation do not. We count kindness shown to others as the greatest of the virtues.

Mr K A Sprayson, the Headmaster of my Grammar School in North Cornwall, which I attended from 1950 to 1957 (prior to coming to study Mining Geology at the Royal School of Mines) was an anti-litter activist ahead of his time. His sterling example motivated so many of his pupils and I would like to use this opportunity to pay tribute to the man and educator that the world could benefit from more of.

Over the years of Lilly’s Plastic Pickup’s activities, we have developed a system of processing the litter we collect, which involves sorting the accumulation weekly into a set standard categories, counting and collating the respective numbers of items and then recycling it all appropriately.

The categories which describe the litter we deal with are as follows –

- Cigarette and Vape packets
- Plastic bottles
- Glass bottles
- Drink cartons, receptacles, paper and plastic cups
- Balloons
- Single use plastics
- Face Masks
- Miscellaneous items



A typical weekly categorised sorting.

Photos courtesy of Jim Platt



EARTH HERO:

LILLITH PLATT

"We counted 91 pieces of plastic in only 10 to 15 minutes. That shocked me. My grandfather told me that anything that falls on the ground finds its way into the ocean, into the plastic soup. That's how my initiative kind of started."

There is still a small incidence of face masks to be found but their heyday was at the time of the COVID-19 pandemic, which was when they first began to appear. Formerly, as well, we were finding substantial numbers of empty 'laughing gas' capsules but these are now so rarely come across that they have been removed from the category list.

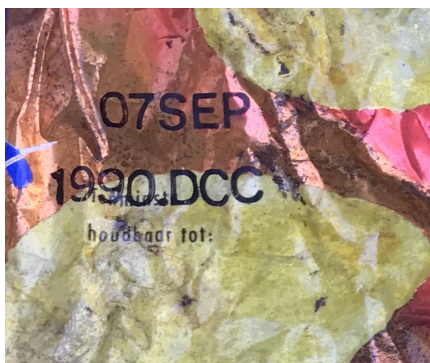
It will probably be noted, and perhaps seen as a fault in me, that we do not handle discarded cigarette ends of which there are a multiplicity. There are, fortunately, others who specialise in cleaning up this toxic scourge on society.

What we do follow however, that aside, is the first principle of litter picking, that what you find is yours – your responsibility to do right by. Let us be sure, without going into detail, that some things we find are not especially pleasant to contemplate or light in weight to carry, but we take them irrespective.

The *Miscellaneous* category is subdivided into three groups, namely plastic, paper and 'the rest', the latter consisting of tissues, bits of tramp metal, rubber, polystyrene and so on.

In collecting litter, one has to be aware that the litter-tossers can be very inventive in hiding the disposal of their discards. It is necessary to have an eye for this, and to know where to look – under and in bushes, in long grass, along the central reservation of roads (it is eye-opening to view the considerable extent of rubbish thrown surreptitiously from passing automobiles), in gutters and hollows, buried in leaf litter.

The earliest item of plastic we have found was discovered poking through leaf litter, and bore a 'best-by' date of 1990 on it. This demonstrates the extent to which plastic in the environment takes no prisoners.



The oldest piece of plastic unearthed to date, poking through leaf litter.



A blackbird's nest interwoven with plastic litter, indicative of its impact on nature.

As noted above Lilly's Plastic Pickup's activities began in 2015. We commenced counting our collection however in 2019, and here are the totals of items collected to date that we have counted –

In 2019	21,686
In 2020	21,559
In 2021	35,113
In 2022	37,823
In 2023 to date	28,577

This gives a total of 144,758 items picked

up to date. Making an estimate for the four missing years 2015 to 2018, the likely grand total could be in the order of 225,000 items.

We do this, as John F Kennedy said, "not because it is easy, but because it is hard". But we do it mainly because it is RIGHT.

To all who have ears to hear, let them hear, and, as Luke wrote (ch 10 v 37) "Go and do thou likewise". With best wishes for a bright future from Lilly's Plastic Pickup.



Lilly and Jim all geared up and ready to go out for another day's litter collection.

GeoIntern 2023

This summer, RSMA Trust helped Crystal Fu, a final year Geology student, with funding to participate in GeoIntern 2023, a fieldwork training course in the Canary Islands. Crystal told us about her experience, which included helping to spread reliable news about the wildfire raging on the island at the time.

I am Crystal, a final year BSc Geology student. I am extremely grateful to the RSMA for providing me with funding to participate in GeoIntern 2023, a four-week science communication and volcanology fieldwork training programme in the Canary Islands. Not only did I gain invaluable knowledge and skills that will stand me in good stead for my future studies and career, but I also made some unforgettable memories with new friends from all around the world.

The first two weeks of the internship focussed on science communication. Joined by Dr Andy Ridgeway from the University of the West of England and Dr Hannah Little from the University of Liverpool, we discussed how to tell engaging stories about science, nature, and society through different media, including articles, videos, podcasts, and presentations. We then put the theory straight into practice by writing blog posts and making films and presentations about different issues in Tenerife that we had learnt about from various experts, such as mass tourism, the lack of volcanic hazard awareness, water shortage, and the forgotten culture of the Guanches, who are the indigenous people of Tenerife. It was empowering to see how our knowledge could be used to help bring about change, as members of the public left positive comments under our published deliverables. The experience has equipped me with the ability as well as the confidence to effectively communicate

science to a wide range of audiences.

The rest of the month was dedicated to researching the application of portable X-ray fluorescence to teaching in geoscience. For this project, we travelled to La Palma to test the accuracy and precision of the technique in determining the elemental composition of different basaltic lava flows, by comparing the results we obtained with published data. During our stay, the island was combating a huge wildfire, so we helped disseminate reliable news and called out false information using the science communication skills we had just learnt. We also had the opportunity to visit the staff of the Spanish National Geographic Institute at work, who showed us how they are monitoring the still-degassing cone of the 2021 eruption. Witnessing the destruction caused by the eruption was very impactful and reminded us of the importance of building hazard resilience in communities that live close to volcanoes. We will continue to work on bridging the gap between scientists and societies to help people better prepare for future volcanic hazards, long after the end of the programme.

Not all my time on the islands was spent working away. We had the chance to hike down Teide (the third-tallest volcanic structure in the world, after Mauna Loa and Mauna Kea), go on a boat ride to watch pilot whales and dolphins, stargaze in the national park, taste local wines at a winery tour, visit lava



Photos: Crystal Fu

tubes with a caving expert, and much more. These were all completely new and possibly once-in-a-lifetime experiences for me, made extra memorable by my fellow interns who had become family.

Being part of GeoIntern has been the highlight of my summer, and it would not have been possible without the generous sponsorship of the RSMA. Thank you again for your unwavering support of my academic and professional endeavours throughout my degree, it has made all the difference in my university life.



There and Back Again

From Aero Eng to Business and then back to Imperial – recounting a journey that has gone full circle

Ian Mackenzie (Aero Eng 1967-70, 70-74, ICBS 2015-present), is Professor of Practice in the Imperial College Business School and Academic Director of the School's Executive MBA Programme. Ian agreed to tell us about his journey from Aeronautical Engineering at Imperial in the late 60s to his current post; and also about one of Imperial's best kept secrets, the Executive MBA course, and why Imperial alumni would be especially welcome.

When I left Imperial in the spring of 1974, with my PhD thesis in Aeronautical Structures mostly written up, I never expected for a moment that I would be back at Imperial some 50 years later. But here I am, a Professor of Practice at Imperial's Business School and Academic Director of the school's Executive MBA Programme working directly with mid-career professionals, many of whom did science or engineering at university and who are aspiring to become rounded general managers.

This article has two motivations. Firstly, I thought my career journey might be of general interest. I suspect we're all familiar with the notion that Imperial engineers end up in a wide variety of careers. However, in retrospect, I seem to have taken the 'variety' bit very much to heart and at one time or other have been an engineering consultant, a management consultant, a Vice-President International, a CEO and now a professor. As I joke to my students, I've still not decided what I really want to be when I grow up!

Secondly, I believe strongly that the Imperial Executive MBA is a fantastic way of achieving a transition from a functional specialisation – including technical specialisations – to a career in general management which encompasses what is now called the C-suite level. Our 'EMBA' provides the usual 'getting up to speed on all those aspects of business management that you felt you know nothing about'. But in addition it prepares participants for managing in a 'technology driven world'. Our competitive distinctiveness is that our participants connect to scientists and engineers across Imperial on both game-changing technologies such as AI and blockchain and grand challenges such as climate change and social innovation. Our EMBA is still a 'best kept secret'. It deserves to be more widely known.

Imperial – the first time

So let's go back to 1970. I had completed my undergraduate degree in Aeronautics and decided to stay on for a MSc. The offer of the sub-wardenship of one of the Southside halls made converting to a PhD a no brainer. I was also pretty involved with the student



Photos: Imperial College

union by then – first at C&G level but then at Imperial level. When the candidate for Union president that I proposed failed his second year Civil Engineering exams, I was pressed into service as Acting President. I was told this was for a couple of months, but the repeated failure to elect anyone else meant that it lasted most of the year – including a six-month paid sabbatical. This was an early learning – always be careful what you say yes to! Aeronautical Structures was really all about the mathematical modelling of physical structures, so as to be able to predict stresses and strains. In my case I was looking at 'structural dynamics' which meant vibrational frequencies and modes of vibration.

I had started to think about pursuing a more general 'business' career – partly because of my experience running the student union and partly because I had gone on a one-week course on 'business for PhD students' run by the Science Research Council ('SRC') who were funding my research. I guess the SRC must have thought there was value in encouraging PhD students to be more aware of business.

Nevertheless, I felt I just couldn't cast 6 years of engineering aside, so I joined a 'computer bureau' called SIA, based in Victoria. They had a very large computer – a CDC7600 – and

people like me who were the interface between a client with a problem (e.g. please analyse this bridge) and sophisticated software packages. In my case I worked with a software system called Nastran which had spun out of NASA. Working on a range of structural engineering problems was fun, but I found myself selling and developing client relationships more than the back-room analysis.

After 2 years it was time to 'pivot'. I scoured the job ads in the Sunday Times (a key source in those days) and ended up taking a job as a Planning Officer in the Economic Planning Department in the HQ of British Gas. It helped that the person who I would be working for was an Imperial Chem Eng graduate! Our team was responsible for the production of the annual Headquarters Capital Investment Programme. This was largely about a new pipeline system to bring gas from the northern North Sea down from landfall in Scotland to the South where the demand was. It also involved building LNG facilities which provided gas for 'peak shaving'. It was the first time I had come up against economics and finance. Specifically I very rapidly learnt about project appraisal and something called discounted cash flow. The only non-technical subject I had done at Imperial was a second-year course in Industrial Sociology which I think we all struggled to engage with.

Doing an MBA

Then came the life changing bit. I had belatedly become aware of business schools and had figured out that doing an MBA might be a great way to really make an effective transition to business/management. I was in the process of applying to London Business School (my friends were quite rightly labelling me a perennial student) when I happened to have lunch with my old A-level chemistry teacher who had left teaching to join a company called Booz Allen Hamilton who were evidently a 'management consultancy'. He strongly advised me to try to go to a business school in the US. When I pointed out that this was totally infeasible due to the enormous cost, he pointed me towards a number of scholarships/fellowships that were available. I duly followed up.

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Given my age (I was then 27) there was only one of these that I was still eligible for. I applied and to my amazement was awarded a 'Harkness Fellowship'. Evidently, my application was helped enormously by a reference from the then Imperial Rector, Lord Penney, whom I had got to know when I was President of IC Union. It's amazing how one thing leads to others in unexpected ways.

The two years I spent between 1977 and 1979 getting my MBA at Harvard Business School (HBS) were hugely transformational. Perhaps the most important aspect was getting the knowledge and confidence to tackle any business problem or situation and use clear business thinking to work out what's important.

Boston Consulting Group Years

In 1979, I joined the Boston Consulting Group, a leading management consulting firm. At that time, BCG was very much seen as the leader in 'strategy', with McKinsey viewed as focussing more on organisation. BCG was a very intellectually-driven firm – primarily around industrial (micro) economics. They pioneered the notion that strategy in business should be fundamentally about generating and sustaining a competitive advantage. Over the next six years I worked to craft and evaluate strategies across a wide variety of industries including carbon fibre, electrical accessories and animal feedstuffs as well as a 'corporate strategy' (i.e. business portfolio strategy) for the diversified Thorn EMI Group. My favourite 'case' was developing an R&D strategy for ICI Pharmaceuticals (later to become Zeneca) which was essentially developing a framework for selecting and resourcing pharma research projects. It ignited a fascination with the pharma/biotech industry which I still have today.

Through the Old Centralians, I continued to keep a connection to Imperial. I had got to know both Dr Tidu Maini (who was working with engineering consultancy Dames & Moore) and Rod Rhys Jones, whose career spanned Civil Engineering, Publishing and Marketing Consultancy and who edited the *Central* for many years. In 1983, the three of us did a study for the then Rector, Lord Flowers, to look at how Imperial could enhance its income through greater involvement in the commercialisation of ideas. (To their credit, BCG allowed me to do this as pro bono work). I visited both MIT and Stanford to understand what they were doing. We came up with a model that identified that there was a spectrum of mechanisms that universities could aim to use – consultancy (by academics), contract research (for industry), licensing of technology (usually to large corporates) and fostering spin-out ventures. This work led Imperial to set up Imperial Consultants, to foster and support consultancy provided by academics, the Enterprise Division, to link Imperial with Corporates for contract research and Imperial Innovations, to support both new, spin-out ventures and licensing. It was amazing to be in at the start of these initiatives

which today are mainstream.

Since my MBA, I maintained a strong interest in management education and developing theory around 'business and corporate strategy'. I took over 'new consultant training' at BCG London. I then took a year out from BCG to help get a new 'Centre of Business Strategy' off the ground at London Business School which was funded by David Sainsbury (CFO of Sainsbury's).

How about a start-up?

It was 1986. I had become a 'Manager' (the middle level between Consultant and Partner) when a close friend from my MBA class who was based in Boston came to London and took me out to dinner. He had also worked for BCG post-MBA but was now CEO of a small venture capital backed business developing and marketing products which applied IT to the finance sector. These products included databases (e.g. for M&A deals), value-added networks (for transmitting research between the so-called sell-side and the buy-side) and bond trading advice. After several such visits, he convinced me to jump out from BCG and start up the 'European arm' of this small Boston-based company. It was all very exciting and offered the prospect of really achieving something (as opposed to proffering advice). But I must admit that I sat there on day one in an empty office close to Bank station waiting for a sales and a support person to arrive in the UK from the US company and wondered what the hell I'd done. At this point I was the Managing Director of pretty much nothing.

It was a struggle at times, but ultimately the businesses worked well outside the US and the company, which had been taken over in 1987 by the (publishing) Thomson Corporation – and ultimately renamed Thomson Financial – grew from nothing to over 100 staff. My remit was then expanded to Asia-Pacific. Hence, I took two week trips every quarter to the main financial centres out there – Tokyo, Hong Kong, Singapore and Sydney. The 24-hour flight home to London at the end was always a killer.

Back to consulting

By 1994, I was Vice-President International (meaning non-US) for Thomson Financial. I found myself working in a well-established matrix organisation (countries versus businesses). It was a far cry from the start-up and high growth phases of development. I missed the intellectual challenge (aka problem solving) of management consulting. I was headhunted by a spin-out of McKinsey called the Mitchell Madison Group ('MMG') who were focused primarily on the financial services industry. With HQ in New York, MMG was hoovering up anyone they could find who had been at McKinsey, BCG or Bain. I jumped again and became a Partner in the Securities Industry Practice which served any firm associated with the investment end of the industry (as opposed to retail banking or insurance). With IT making great advances and the internet emerging, the late 90s proved

to be a very exciting time for consulting with loads of innovation and change.

In 2000, the Partners sold MMG to a US-based web-site builder called US Web – who subsequently sold themselves to a Chicago-based 'back-end system integrator' called Whitman-Hart. The idea was to have a firm which covered strategy advice, online marketing (the subject of another acquisition) and IT implementation (both front and back). Whitman Hart then changed the name of the whole caboodle to 'March First'. I was appointed 'European Head of Strategy Consulting Practice'. Very grand!

Unfortunately, within a month, the 'dotcom crash' happened! The IT part of the business (80% of the staff) collapsed – orders just dried up. The house of cards came tumbling down.

I took my immediate team, got into a lifeboat and rowed over to a relatively small strategy consulting firm called OC&C Strategy Consultants where I knew the founder.

Back to Imperial

The next few years as a Partner at OC&C (focussed on the financial services industry) were relatively uneventful. I got to a point where I felt that I had 'done' the mainstream consulting thing. For whatever reason, my yearnings to get into management education re-emerged. Through my continuing Imperial contacts. I was doing a piece of consultancy for Imperial Innovations and was introduced to Prof David Gann who was head of the Innovation and Entrepreneurship Group at the now rapidly growing Business School. The old Management School had been reinvigorated in 2003 with the injection of funds from alumnus Gary Tanaka and the arrival of an ambitious and uncompromising Dean in the form of Prof David Begg. (The Tanaka name was subsequently dropped a couple of years later for reasons that you can google.) David Gann had just published a book called 'Think, Play, Do' on how the process of innovation was changing. He was getting requests from companies to help them become more innovative. However, he had no time to actually do the work. We teamed up and 'Think Play Do Ltd' was born as a specialised, innovation management consultancy with a goal of doing interesting work without killing the staff through over-work. David was Charman, I was CEO. We did some fascinating work over the next few years. Importantly, this association allowed me to get involved with teaching at the Business School, at first with Executive Education (where I designed and led programmes for specific companies) and then on the MBA programmes. I loved it.

Back to HBS

In October 2011, I was in White Plains, New York State, delivering an Exec Ed programme with David for IBM. I decided to visit an old MBA classmate who was on the strategy faculty at HBS. He told me that a member of the faculty had just had to pull out of teaching the main year 1 MBA strategy course which

was starting early in 2012. (The MBA cohort is so large at HBS that it requires 6-7 strategy instructors each year to cover all 10 student 'sections'). I jumped at the chance to teach at HBS and, with my slightly stunned wife, moved there and started teaching in January 2012. It went well and my initial one-year 'cover an absence' deal was extended first to 18 months and then to a total of 3.5 years. It was a dream come true for me to teach there with their wonderful facilities and sharp students.

Back again to Imperial

By 2015, I needed to return to the UK. My time in Boston had extended way beyond expectations and my wife was back in the UK looking after grandchildren. The then Dean of Imperial College Business School ('ICBS') appointed me to the faculty in 2015 to teach strategy and business problem solving which is essentially consulting skills. In 2020 I was appointed as a Professor of Practice – a term borrowed from the US – which Imperial recently embraced as a way to recognise senior individuals who had a strong career in 'practice' as opposed to having come up the academic publishing track. As you might imagine I think involving senior practitioners in business education is very valuable and needs to be further encouraged.



THE IMPERIAL EXECUTIVE MBA PROGRAMME

In 2019, I took over as Academic Director for the Executive MBA Programme, which is a two-year, part-time programme for mid-career executives – age range 30-45 – who want to accelerate or shift their careers. The mix of backgrounds and nationalities is very eclectic. There are typically around 30 participants on the EMBA.

By definition, all EMBA programmes seek to help managers transition from functional to general management. Hence, they are all fundamentally generalist – getting everyone up to speed across a range of basic disciplines. The Imperial EMBA covers 8 such 'core' disciplines in the first year: accounting, economics, finance, innovation, leadership, marketing, organisational behaviour and strategy. In addition there is a course called 'Executive Leadership Journey' where participants learn about themselves, develop important personal skills and explore their career goals and options. Each participant is allocated a personal coach.

In the second year, participants in the Imperial EMBA do have the chance to specialise

as everyone needs to choose 5 'elective' courses from a pool of over 50. In addition, everyone does a substantial individual project of their own choice. These are typically in the form of a consulting assignment.

The 2016 Enhancement

The market for individuals to come on EMBA programmes is very competitive. Here in the UK alone, we have sound EMBA programmes offered by Cambridge (Judge), London Business School, Oxford (Said), Bayes (formerly Cass) and Warwick. So the challenge is to achieve some measure of differentiation while still providing that generalist core.

Academic Directors have a responsibility to make sure that the programme remains relevant and is delivered to a high standard. But they also have the opportunity to develop and enhance the programme. My predecessor, Prof George Yip, made three important enhancements back in 2016:

1. He moved the target age range from late 20s to 30-45 so that it became a proper 'executive' MBA rather than just a part-time version of the core, one-year full time MBA (which has average age around 27).
2. He introduced 'blended learning'. This means that participants in the programme do around 8 hours of on-line (asynchronous) preparation for each course before they come to Imperial for a 4-hour face-to-face class session. This has turned out to be an important differentiator for the programme for two reasons.
 - a. The online format is very efficient for getting over much of the basic concepts, frameworks and tools that we teach. This leaves the class to focus on application and discussion.
 - b. The blended approach reduces the number of days that part-time students need to be away from their day-jobs. In fact, in the first year, our EMBA's come to Imperial for 2 days (Friday and

"I can't help but feel that there are many Imperial alumni out there, whether you have done science, engineering or medicine, who would find our EMBA brilliantly transforming. It would be great to have you back at Imperial!"



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Saturday) roughly every 4 weeks. Hence around 26 days a year of which 13 are workdays. This tends to be lower than other EMBA programmes.

3. He introduced two one-week overseas residencies aimed at experiencing business in another country and learning more about international business. One was in Berlin, the other was in Hong Kong/Shenzhen.

Recent Enhancements

I've always felt that one of the most valuable aspects of MBAs at any level is that it gives you a great opportunity to expand personal networks. Part of this is intra-cohort, part is cross cohort and part is being exposed, via the programme, to smart influential business leaders. Hence one of the first things that I did when I became Academic Director of the Imperial EMBA was to establish a series of 'business leader talks'. This involves successful business leaders simply coming to Imperial for a fireside chat about their careers and what they've learned, the latter often coming from their mistakes.

More generally, it was clear that we already had a first-class EMBA with great teaching, a great spread of electives and an excellent 'career development' course. ICBS already had a good reputation in 'innovation and

entrepreneurship' – which you would expect, being located close to world leading science, technology and medicine. In addition, ICBS has an overall market positioning which talks about 'leading in a tech-driven world'. But I felt we needed to go further. I commissioned research around why participants chose the EMBA programme that they did. There were three main findings:

1. As a more recent, 'up-and-coming' business school, ICBS does not have the brand that longer established business schools do. However, the 'Imperial' brand carries huge weight. Hence it became clear that we needed to enhance the 'Imperialness' of our EMBA.
2. Prospective participants are more and more aware that 'technology' is impacting business to an increasing extent and that being able to understand something of these new technologies is essential to effectively engage with their business implications.
3. Prospective participants care more these days about how business can play a meaningful role in addressing the so-called Grand Challenges that world society faces.

These findings led to two major new initiatives:

1. I have replaced the Berlin residency with a one-week US Residency which is based partly in Boston and partly in Silicon Valley. In Boston, we spend 2 days at MIT. Out in California, we spend one day at Stanford University one day visiting an R&D organisation, an incubator and an accelerator. The overall aim of the residency is to provide opportunities for participants to hear about – and connect with – 'technology, innovation and entrepreneurship in the US'.

2. I have curated a new first-year, year-long course called 'Game-changing technologies and Grand Challenges'. The first half gives participants the chance to enhance their appreciation of some important technologies such as AI, Blockchain and Energy Storage. The course also aims to address the 'so what for your business' question. The second half provides opportunities to discuss various so-called Grand Challenges such as climate change, sustainable materials and social/inclusive innovation. This part of the course also seeks to explore the relative roles of business and government. Importantly, this new course has provided a great mechanism for building linkage between ICBS and faculty across Imperial – something that is greatly appreciated by our EMBA participants.



My strong belief is that we now have at Imperial **the best EMBA** (certainly in the UK) for participants who want the transition to general management, who recognise that being able to leverage technology is critical and who want to do something to address Grand Challenges.

Gradually the word is getting out.





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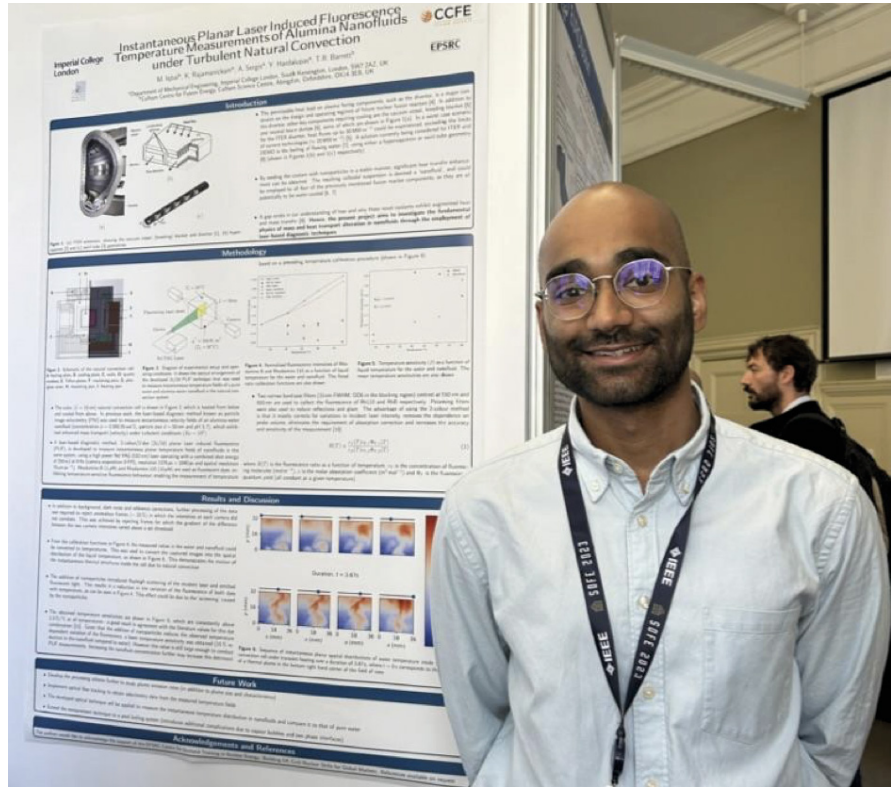
SOFE 2023, Oxford

In the Summer, OC Trust supported Mustafa Iqbal, PhD Candidate in the Thermofluids Division, Department of Mechanical Engineering, to attend the IEEE Symposium on Fusion Engineering (SOFE) in Oxford and present a poster on his research.

It was a privilege to attend the 30th IEEE Symposium on Fusion Engineering (SOFE) in Oxford, UK, from July 9th to 13th 2023. This year was a record for SOFE, with the largest number of registrations since 1979, researchers and innovators in the fusion sector from across the globe were present. Over 700 delegates from over 26 countries were hosted by the UK Atomic Energy Authority, the first time the biennial international conference has taken place in the UK. Given fusion's approach towards commercialisation, a broad scope of topics was presented, from tritium breeding to high-heat flux technology (my field).

I had the honour of presenting a poster on my PhD research, namely the development of a 2-colour laser induced fluorescence method for non-invasive, spatiotemporally resolved temperature measurements in liquids. We are applying this to nano fluids, a novel coolant comprised of a typical heat transfer fluid such as water into which nanoparticles ($d < 100$ nm) are stably suspended. Such fluids exhibit significant augmentations in heat and mass transport, with the underlying physical mechanisms undetermined. Hence, through our measurements, we aim to elucidate on the underlying physics. My poster received significant interest from the attendees of the conference, with fruitful interactions from my industrial supervisor from UKAEA in addition to other people from the Authority who were highly interested in my work. I also had questions and interest from other attendees, such as PhD students and professors. It was a helpful experience to present and explain my work, aiding me in developing my understanding of it, in addition to the pleasure of interacting with other scientists in my field.

My conversations with members of the UKAEA were especially helpful in bridging a gap in communication between them and our research group at Imperial (not helped by the pandemic). Without my presence at this conference this reconnection would not have happened. It was useful to discuss with them their implementation of nano fluids, and to advise on areas in which their approach was incorrect, in addition to catching up on the state of research in both of our groups. I was also able to ask and receive advice with regards to employment post-PhD, which I found very useful. I also connected with a PhD student from Prague, with whom I am now in discussion regarding our joint research field and the pertinent questions it presents, with new issues of significance being brought to my attention, such as the effect of an applied magnetic field on the boiling point of water and the effect of surface roughness and



geometry on critical heat flux.

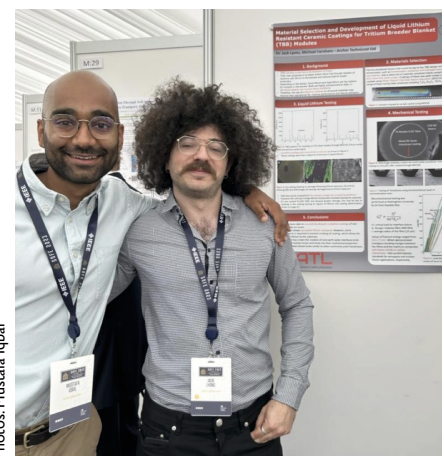
Aside from these interactions, I also attended all of the talks and panel sessions, with the freedom to choose talks of interest when sessions were concurrent. These were especially interesting, as I was brought up to speed in the latest developments in the fusion field, and how the public-private collaboration and interaction is evolving. Specifically, it was good to see the deployment and intention to use water-based coolants in several high-heat flux applications in fusion (with expected heat fluxes to only increase as fusion reactors become more powerful). This leaves the door open for the stable suspension of nanoparticles to significantly augment heat transfer. I also

had the opportunity to network and meet new people, professors from international institutions, heads of national research labs and CEOs of fusion start-ups. I also had the pleasure of reconnecting with an old friend from my Nuclear CDT at Imperial.

To conclude, it was an immense joy to attend this conference. I am extremely grateful to the Old Centralian's Trust for their generous travel award to help me to realise this trip. The experience gained from presenting and explaining my research, networking opportunities and insight obtained from attending talks and panels have added an immeasurable credit to my PhD experience and thesis.



Photos: Mustafa Iqbal



Triodes 55th Re-union



From left to right: Jay Yiakoumetti, Peter Wright, Caroline Danks and Tony Danks, Nick Hiscock, Martin Clemow, Phil Harris, Peter Cheung, Richard Lewis, Simon Pengelly, Peter Marlow, Pat Mason, David Mansfield, Rut Patel, Graham Castellano, Eddie Hyams, Hugh Culverhouse, Sid Seth, Steve Glann and kneeling Martyn Hart and Paul Cheung.

Twenty-one triodes attended our 55th reunion at Imperial College's Union Bar in May. The largest number ever.

Normally we have our reunions on the first Friday after the New

Year, but since we mostly have stopped working there is no need to do it then so this was our first time moving the meeting to May and lunch time on a week-end.

We all had a great time chatting,

drinking and eating and here we are outside the 568 Bar in the sun!

Our 2024 reunion will be on Saturday 18th May 2024, mid-day currently again at the Union Bar and we will be at the Decade

Reunion on Saturday 25th November 2023. For more details contact martyn_hart@btinternet.com

Martyn Hart

Imperial students win national James Dyson Award

Respiratory health device *Pleural* has won the UK James Dyson Award 2023. *Pleural* was designed by Imperial Innovation Design Engineering MSc students at the Dyson School of Design Engineering, Daniel Hale, Will Eliot, Fergus Laidlaw and Yihan Dong, to help combat mucus in the lungs, commonly seen in patients with asthma, COPD and cystic fibrosis.

Pleural administers 'chest physiotherapy' to help expel mucus from the airways. Other handheld devices are either too difficult or too expensive for most patients to use, the team say.

The device uses artificial intelligence (AI) to mimic a doctor applying chest percussion to

sufferers whilst also monitoring breathing rates, which ensures the force applied is tailored to each patient but takes years of training.

With *Pleural*, users place the device on their chest, while it produces percussion and vibration to dislodge and thin the mucus in the chest, allowing them to expel the mucus independently at home.

Speaking to the Press Association, Daniel Hale, engineering lead for *Pleural*, said: "Winning the James Dyson award means that we'll be able to develop *Pleural* and take this product to those affected by mucus-related respiratory health conditions, impacting their lives for the better. The James Dyson Award represents the forefront of

innovation to us, particularly in the UK, and has been something we've all tracked as long as we've been designers. It's a huge honour that *Pleural* has been selected as the UK National Winner in 2023, to join many of the proposals we've admired over the years, and we look forward to developing *Pleural* further."

This is the third time in four years that an Imperial team has received a national James Dyson award. The Awards celebrate designers with an up-and-coming idea to solve global problems. The 2022 UK winner of was *Dotplot*, a breast monitoring device founded by Imperial MSc Innovation Design Engineering students, Debra Babalola and Shefali Bohra.

<https://bit.ly/IE39-DysonAwards>
Both of the 2023 runners up are also from Imperial:

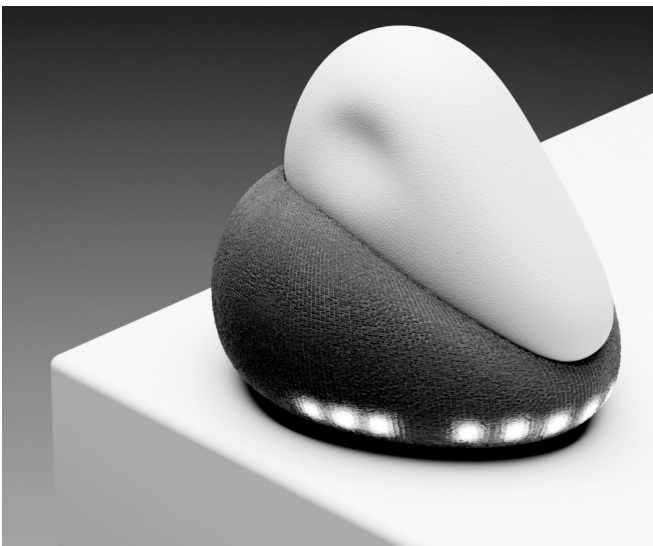
Reef dB is a structure by Eden Harrison from Imperial's MSc Innovation Design Engineering, designed to filter underwater noise pollution from offshore windfarms while regenerating the ocean floor.

By forming a barrier around wind turbines, the structures prevent sound transmission through vibration and resonance, instead dissipating sound energy as heat, while also providing attachment points for sea creatures.

Viwipe is the world's first non-invasive, affordable and paper-based HPV self-test, designed by Yihan Dong, who also cofounded *Pleural*, and Dr Kenny Malpartida Cardenas (Research Fellow in the Department of Infectious Disease).

More than 300,000 women lose their lives to cervical cancer every year, of which 99% of cases are linked to HPV. The team have harnessed the power of important biological markers which are found in menstrual blood to accurately detect HPV in the form of a simple sheet of 'toilet paper'.

The founders hope to see their product in universities, where women can pick up a test package, use the test, like toilet paper, and post it back to the lab to be analysed.

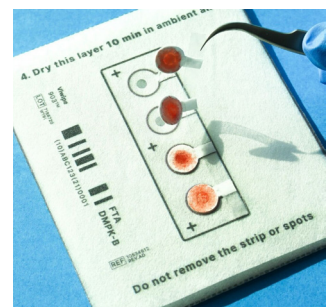


The team hope *Pleural* can make a difference to those that suffer mucus-related health issues like asthma, cystic fibrosis and COPD — which they say affects 3.9 million people

Photos: Imperial College



***Reef dB* aims to reduce underwater sound pollution**



***Viwipe* harnesses the power of biological markers in menstrual blood**

Imperial alumni changing the world one tech at a time

Five of Imperial's most exciting startups showcased their innovative solutions at an event in San Francisco in September. They travelled as part of a wider Imperial delegation to San Francisco and the Bay Area. Their solutions and products were showcased at a special event at San Francisco's iconic Shack15 venue – with an audience of investors, journalists and industry leaders. The showcase was made possible through the support of Imperial alumnus Michael Hughes

(Aero Eng 1987-91), who leads the Silicon Valley Internship Programme (SVIP) and is co-founder and CEO of LoopUp.

All these startups have emerged from Imperial's thriving innovation ecosystem. This encompasses a range of supportive programmes and facilities. The overarching aim is to nurture innovative solutions that can change the world for the better, one tech at a time. At the event, Imperial President Hugh Brady also launched the Imperial Investment

Portal, extending Imperial's current ability to connect diverse investors and startups in the innovation ecosystem, boosting the visibility of Imperial-associated startups seeking investment and offering up-to-date information about them.

The startups also attended the prestigious GBx Gala Dinner, the premier annual event for British founders and entrepreneurs in the Bay area, at which the UK's Chancellor of the Exchequer gave the keynote speech.

During the trip, technology entrepreneur and Imperial alumnus Wendy Tan White (Computing 1988-92) welcomed the Imperial delegation to Intrinsic, a pioneering robotics software company, part of the Alphabet Group, where she is CEO. The delegation also discussed collaborative and student training opportunities at cutting edge electric vehicle company Lucid Motors at the invitation of CEO and Imperial alumnus, Peter Rawlinson (Mech Eng 1976-79).

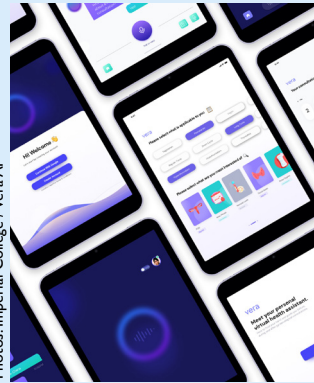
vera AI

In recent years, it's been increasingly acknowledged that women's health has been neglected for decades by the wider medical establishment – for example, with gender bias in research, and with conditions such as endometriosis and polycystic ovary syndrome (PCOS) historically overlooked or misdiagnosed.

vera AI, co-founded by Diana Canghizer and Federico Vaghi, is a platform seeking to transform hormonal and gynaecological health management using AI to create hyper-personalised guidance. Diana is a graduate of the Innovation Design Engineering (IDE) master's programme, jointly run by Imperial and the Royal College of Art, while Federico is an Imperial graduate of the Human and Biological Robotics master's course.

The idea of vera AI originated from Diana's personal experience of several years of misdiagnosis. "I didn't know what was wrong with my body. I didn't understand why I had the symptoms I had. Social media was confusing; friends and family didn't know either." It wasn't until three years after first speaking to a doctor that Diana was diagnosed with polycystic ovary syndrome (PCOS) – a common hormonal condition that affects the ovaries, known to be widely misdiagnosed. "It turns out that it was affecting other aspects of my health and personal life and I just wondered, am I the only one going through this?" She was not. After speaking with more than 50 women and people who menstruate, she found out that there were a lot of similar experiences around hormonal health misinformation, miscommunication and misdiagnosis. "Some of the stories were shocking and I just thought, we need to do something about it."

Federico says one of the biggest problems they identified is the communication gap between doctors and patients. "During our interviews our users have expressed the difficulty in communicating with medical practitioners. Likewise, GPs have told us that patients sometimes struggle



Photos: Imperial College / vera AI



Diana Canghizer

to accurately convey their symptoms or that the consultations are too short. Therefore, we are developing a generative AI personalised assistant on the platform to bridge that gap and help optimise the 10-minute consultations currently given in GP practices in the UK, by guiding patients how to monitor their symptoms and how to prepare for consultations."

But vera AI's ambitions extend beyond women's health, it's about personalised healthcare too. "Every woman's body, hormonal profile, response to medicines is different and the only information you can find online is very generalised," says Diana. "The Royal College of GPs has said loud and clear that we need personalised patient dashboards by 2030. The future of healthcare is personalised and our platform is part of that movement."

Diana won the Young Innovators Award 2023 from Innovate UK, and this grant helped her to fund some of the research and development for vera AI <https://www.vera-ai.com/>.

Phare Labs

Phare Labs is an Imperial start-up aiming to make families safer and healthier in their own homes. Co-founded by Imperial alumnus Arnau Donate (MSc Global Innovation Design) and Daniel McBride (London Business School), the company has developed an AI-powered smoke alarm and indoor air quality monitoring device.

Smoke alarm technology has changed little in the past 50 years, Arnau says. And more importantly, their research has shown that existing smoke alarms only detect around 40% of genuine fires and are extremely prone to false alarms (around 89% of alarm activations are spurious).

Phare Labs uses a suite of five sensors coupled with machine learning algorithms to more accurately and rapidly determine if smoke is from a real fire or non-emergency source like cooking smoke, dust, or pollen.

"Our device gathers over 20 data points every second and we use AI to identify patterns, build up a real-time picture of the air composition, and how it changes, to understand what's happening in the room. We've shown in the lab that we can detect fires up to a minute earlier than existing smoke detectors and so in theory prevent fires from escalating at the most critical moment."

The device is also able to look at trends in indoor air quality over time, including the potentially harmful build-up of pollutants such as carbon monoxide, nitrous oxide and particulate matter, and prompts its users to take action, such as opening a window to ventilate their home.

"We tend to think of air pollution arising mainly from cars and factories, but indoor air quality can be up to five times worse than outside. That's partly because houses are increasingly well insulated, which is great for energy efficiency, but that means there is not air flowing through the house,



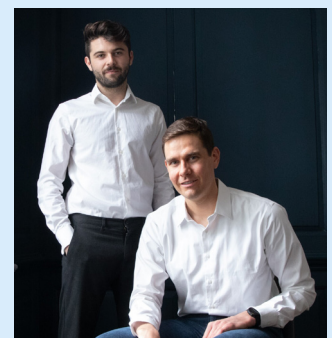
Photos: Imperial College / Phare Labs

and you get numerous sources of potential pollutants such as emissions from gas cooking stoves and wood burners."

The company has rigorously tested and developed its device in the lab and in 30 homes and is due to launch a commercial device direct to consumers in 2024.

"Our goal is to make 500 million homes safer and healthier places to live. We're taking things one step at a time," says Arnau.

<https://www.pharelabs.com/>



Arnau Donate and Daniel McBride

Dotplot

Dotplot is a healthtech company that aims to facilitate early detection of breast cancer. It was co-founded in 2022 by Debra Babalola and Shefali Bohra, whilst they were studying for the IDE programme.

“Dotplot is a tool that equips women to conduct accurate self-checks each month. There is currently no other tool on the market that can assist you to do a breast self-check – just pamphlets and information online that isn't personalised, meaning there's a lot of guesswork involved.” says Shefali.

Breast cancer is the second most prevalent cancer in the world with 2.3 million cases registered in 2020, causing 685,000 deaths globally. With early detection, survival rates increase up to 93%.

Dotplot offers a handheld device that pairs with a mobile app to help women perform breast checks every month. The tool creates a 3D model of the user's chest and uses menstrual cycle data to predict and remind users to do their self-checks. It will alert the users when a reading differs from the baseline created with the first scan.

The team have held multiple co-creation workshops with breast cancer survivors to understand the need.

“The stories I hear drive me to keep going with Dotplot, especially when you talk to women who are at increased risk of breast cancer. A tool like ours can really help catch changes early and address the anxiety associated with being more susceptible.” says Shefali.

Sharing her founder journey, Debra said, “I had the confidence to pursue Dotplot because I saw so many other people coming out of Imperial creating start-ups with huge impact.”

Dotplot won the 2022 Venture Catalyst Challenge, Imperial's flagship entrepreneurial programme, and the 2022 national James Dyson Award.

“The whole support network at Imperial is brilliant. From the Enterprise lab, to the training to the mentoring schemes,” said Debra. “The environment at Imperial gives you the confidence and skills to bring an idea to life and to aim high. One day, we hope to expand Dotplot's technology to other diseases beyond just breast cancer.” <https://dotplot.co/>



Dotplot founders Debra Babalola and Shefali Bohra

MakeSense Technology

When it comes to empowering people with tech, it's difficult to find a more tangible example than MakeSense Technology, a start-up company formed at Imperial co-founded by CEO Dr Rob Quinn (Visiting Researcher at Imperial and Imperial PhD graduate).

The team is developing Vector, a cost-effective, hand-held 'sensory substitution device' to help people with vision impairment navigate completely independently. Users hold the device in front of them like a torch, while advanced AI-based computer vision and localisation technology provides haptic cues to direct them. It will also recognise faces, read text and act as a screenreader.

Rob explains: “We're using a type of AI called computer vision, where you can take pixels from a camera, put them through an algorithm, and derive meaning from those pixels to identify objects and make inferences about environments – for example, distinguishing between a pavement and a road. It's what driverless cars use at the cutting edge. We're also using other types of AI for high fidelity localisation.”

MakeSense aims to provide a cost-effective alternative to guide dogs, which cost £55,000 to train and are only offered to 1% of people with vision impairment. As part of development and testing, the company has



Dr. Rob Quinn

worked closely with charities such as Blind Veterans UK and is aiming to raise around £2.5 million to get their device to market. “It's impossible for a person that has sight to understand or truly put yourself in the shoes of someone who has vision impairment. You can close your eyes and even try and walk around, but it's just not the same as experiencing permanent sight loss. So, in everything we do, we must engage with those who are affected by vision impairment. Some of these people have been quite emotional after using the device.” <https://makesense.technology/>

Osstec

Another innovative start-up aiming to get people moving around again is Osstec – led by CEO and founder Dr Max Munford (Imperial Research Associate and Imperial MEng and PhD graduate). Osstec is developing 3D-printed, orthopaedic implants that mimic the properties of real bone and even stimulate the growth of healthy tissue in people with osteoarthritis. There are around 1.3 million knee replacements performed every year around the world (including around 100,000 in the UK) which could benefit from the use of this technology.

“Existing total knee implants work well at reducing pain, but they simply don't restore natural function and gait – research shows that people don't walk normally after a total knee replacement. They also need replacing approximately every 15 years, so if you're 55, you'll probably need new implants at 70, then again at 85 – and every time you remove more bone, and the patient becomes more inactive. People want and need more from their implants: they want to be able to kneel on the floor and play with their grandchildren, go jogging or even play higher impact sports like skiing. We've already shown that we can do a lot better with the implants we're developing. Our vision is to empower people to stay healthy and active, and



Dr. Max Munford

that's what our new technology offers orthopaedic patients.”

Osstec recently conducted pre-clinical trials of their device, with highly promising results, and closed a £1.2 million funding round in early 2023.

<https://osstec.uk/>

An inspiring leader, always up for a challenge

PROFESSOR PATRICK J DOWLING CBE, BE, DIC, PhD, CEng, FEng, FRS, FStructE, FICE, FRINA, FCGI (Civ Eng 1961-2, 65-68, 72-94) On 28 April 2023, the Association lost a stalwart of Imperial Engineering and one of its strongest supporters, with the death of Patrick Dowling, after a period of illness and poor health.

Born on 23 March 1939 in Dublin, Patrick graduated from University College Dublin with a degree in Civil Engineering. He undertook his postgraduate engineering education at Imperial, gaining a DIC in Structural Engineering in 1962 and completing his PhD in 1968, following a period working in industry. He continued at Imperial as a researcher, sponsored by CIRIA and the British Steel Corporation, and joined the teaching staff as a lecturer in 1972. He rose rapidly through the ranks to become Head

of Department in 1985. In 1994, he moved to the University of Surrey to become Vice Chancellor, a post which he held with distinction until his retirement in 2004.

During his career there were many milestones, not the least of which was his year as President of CGCA in 1999-2000. In 1994-95, he was President of the Institution of Structural Engineers; in 2000-2002 he served as Vice President of the Royal Academy of Engineering and while doing so, he also served as Chair of the Engineering Council, 2001-02. During his career, he received many honours, including Fellowships of the Royal Academy of Engineering and the Royal Society as well as honorary degrees from universities around the world.

Patrick became Head of the Department of Civil Engineering in difficult circumstances, having to take over following the untimely

and unexpected death in service of Professor Ian Munro which was followed by a short and temporary tenure held by Professor John Burland, pending Patrick's permanent appointment. An immediate notable task facing him was to step in as a key participant in a royal visit, that of the late Queen Elizabeth to the College. In carrying out this role with flair and confidence, he set the tone for the whole of his period as HoD.

In taking on the Headship, Patrick was very keen to maintain his position as an active engineer and researcher and therefore made a decision which was both important to him and influential for the College as a whole. At a time when it was not fashionable to do so, he was the first HoD to appoint a senior professional administrator within the Department to work alongside him as a right-hand person, taking the bulk of the operational

administration off his shoulders, allowing him to focus strongly on his role as an academic leader within the College as well as a leading professional engineer in the world outside. This model operated in a way similar to the interaction of a Minister and Permanent Secretary working together in a well-run Government department and is now an established practice across the College.

As a leading Engineer, Patrick's interests and activities included stiffened steel plates, composite beams, cylindrical shells, portal and space frames, offshore structures and earthquake engineering. As a leading researcher he wanted to understand the design, behaviour and operation of key structures, and was able to apply this knowledge to projects such as the rising gates for the Thames Barrier and the development of the Hutton Tension Leg Platform. As a leading policy advisor, his work was instrumental in supporting the Merrison Committee, established in 1970 to handle the collapse of a number of box-girder bridges, and as the first Chairman of EC3, the Eurocode for steel construction, he led the way in establishing new ways of doing steel design. He also took engineering education beyond Imperial into the wider university sector and the profession in several important roles, particularly in his role as Chair of both the EU and UK Steel Design Education Programmes and in the establishment of the Steel Construction Institute.

Even though an Imperial man through and through, he moved on in 1994 to take up the Vice Chancellorship of the University of Surrey, where he made a very big impact, establishing a new vision for the University in collaboration with industry and commerce, in developing an important investment programme for campus infrastructure, and in setting Surrey on a new path as an important research-orientated institution.

Patrick always seemed to be up for a challenge and pretty much always succeeded, whatever projects he undertook. He was always active and on the move, getting involved all the time, leading the way and inspiring his colleagues to greater heights. He made a great contribution to both engineering and education and will be sorely missed by all those who knew and loved him.

Colin J Kerr
(with thanks to Professors
DA Nethercot and RE Hobbs for
background information)



Photo: Courtesy of the Institution of Structural Engineers

Professor Dowling when he was President of the Institution of Structural Engineers, 1994-5

Life at Imperial had been so rewarding he set up a scholarship

JOHN McDONOUGH, CBE
(Mech Eng 1970-73)

John was born in Liverpool on the 8th of November 1951, as the youngest of 4 children with the family living in Wigan and their father being a miner in a local colliery. John attended John Rigby Boys Grammar School, where he excelled both academically and in sports. He played rugby for the school as well as being an outstanding all round cricketer and cross country runner. It was around this time in his teens that sadly his father died.

Having achieved excellent 'O' & 'A' levels, he decided to take an early form of gap year, working on a Wimpey construction site in Skelmersdale, where he was exposed to some of the 'tricks' of the building trade as well as becoming the runner for the Irish workers to the local bookies.

In 1970 he took up his place at Imperial College to study Mechanical Engineering and, continuing his avid interest in rugby, he was invited to join the first XV rugby team, eventually becoming captain in his final year. But despite the distraction this and post-match celebrations provided, he graduated with first class honours in 1973, along with his nickname Tripe from the Links Club.

After leaving university, he joined Massey Ferguson in Coventry, on their graduate trainee programme, with placements in different departments until eventually being promoted to Warehouse Manager in 1981, based at their Urmston Plant,

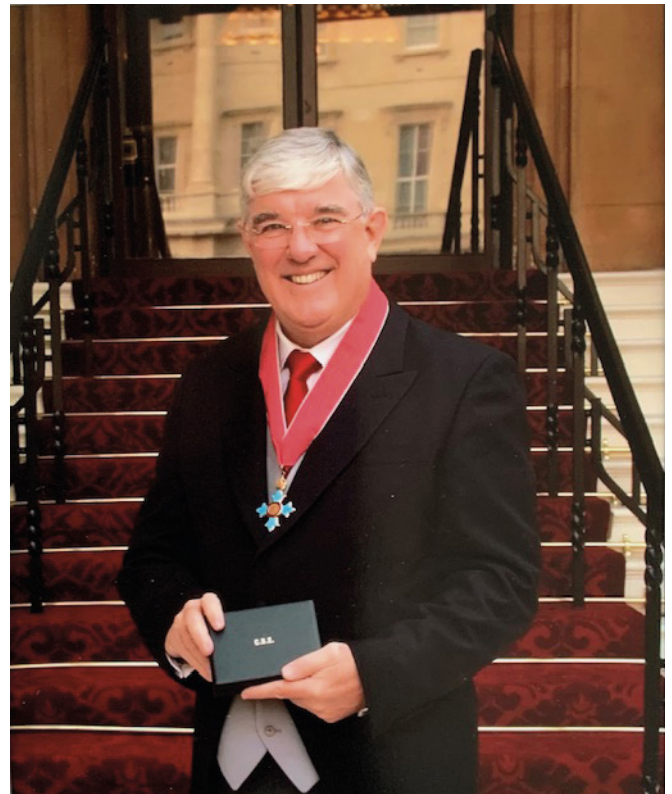
where the spare tractor parts were stored. It was here that John learned his skills in managing workers and negotiating with Unions. It was a challenging time but a valuable one.

Whilst in Coventry, John joined a local rugby club, the Old Coventrians and continued playing and becoming captain of the first XV team, until his move to Urmston. It was also whilst working in Coventry that he met Lynne and they married in 1977. When John became Warehouse Manager, they eventually moved to Wilmslow in 1982 and in 1985 they adopted first Lindsey and then Peter.

By 1992, John had been invited to join Johnson Controls in a senior management role and began working in Germany, and in 1993 the family followed him out there where they lived until 1995 when he took up a vice president position in Singapore. In 1998, the family moved back to the UK with John having been promoted again, and in 2001 he was appointed CEO of Carillion where he saw through the transition from construction to services from 2001 to 2011, when he retired aged 60.

He had been Chairman of the CBI's Construction Council from 2008 to 2011 and Vice Chair of the CBI Public Services Strategy board, and in the 2011 Queen's birthday honours list, he was awarded a CBE for Services to the Construction Industry.

Retirement didn't represent a tranquil period with him taking up Chairman positions with Vitec, a video broadcasting company, highly involved in the 2012 London



Olympics; Vesuvius, a company involved in high temperature applications; and Sunbird, a construction services business in East Africa. Also during this time, John became involved with Team Rubicon and continued to support them in their endeavours after stepping back from their Board.

Because his University life had been so rewarding for him, John also decided to support Imperial College by funding a scholarship to

help students who were studying Mechanical Engineering, and to date three students are benefitting from this scholarship.

John's Board commitments finally ended on December 1st last year when he finally RETIRED! Hopefully to enjoy some family time with Lynne and their three grandchildren. But sadly that was not to be.

*Obituary supplied by
Lynne McDonough*

ALUMNI



WE NEED YOU TO WRITE FOR US

- Are you engaged on an exciting project that would be of interest to other alumni?
- Have you received an award, honour, fellowship or some other significant recognition?
- Have you recently had a book published?
- Would your career experience be useful to recent graduates?
- Have you got entertaining stories to tell of your time at Imperial?

If the answer to any of these questions is "YES", "MAYBE", or even just "Well..." then get in touch with the editor (contact details on page 2)

IN BRIEF

JOHN ANTHONY ROSSER
(Elec Eng 1958-61)

John passed away peacefully at Royal Derby Hospital on 5th September 2022, aged 82 years. Loving husband to Ann, kind father to Jonathan and Nicholas, and caring grandad to Eleanor and Daniel. John will be sadly missed by all who knew him.



