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ICRTS WALES VOLUNTEERING TRIP

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

ISSUE 41 *Autumn 2024*

ISSUE FORTY-ONE
Autumn 2024

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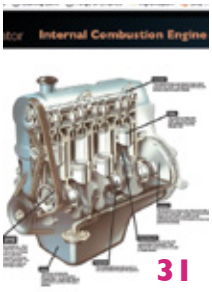

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FINAL COPY DEADLINE FOR THE NEXT ISSUE: MARCH 28 2025

Kelvin Higgins

Professor Anil Bharath has stepped down as the CGCA's president but remains on the committee as the immediate past president, a role that has been vacated by Professor Atula Abeysekera. Both have been very supportive as I begin my term. On behalf of the Association, I would like to express our gratitude to both for their service, enthusiasm and continued support.

We held our flagship event, the Annual Dinner, at Stationers Hall in March. This was the 110th such event and it was very well attended. We were entertained by Professor Brady, Imperial's president. He explained the internal changes to the college and announced the rebranding of the institution now known as simply Imperial. It was particularly pleasing to see so many younger members present and I heard that the post dinner event was also a great success. For several years, Colin Kerr has shouldered the responsibly of organising this event but now, for family reasons, he is taking a back seat and so we are forming a sub-committee to continue the organisation which will include the City and Guilds Union. I would like to thank Colin for all his efforts. He has offered to continue to look after the wine which I am certain that we will all agree is a very important role.

Details of the Reunion Dinner were given in the January Newsletter. It was held at the Rembrandt Hotel. This was a very well attended event, approximately 62 alumni and partners were present. Thank you to Peter Chase for continuing to organise this event.

Anil has been working on a Wikipedia entry for the Association. I understand that the entry has been prepared and we are just waiting to see if it can be posted. We await developments.

This year, we decided to hold the AGM on a Saturday in the hope that we would attract more participants. Unfortunately, this was not well publicised, and attendance was not what we would have wished, although a number of students did attend who expressed interest in our affairs which was encouraging.

As I write, there is some concern about the future funding of Boanerges and other motorised mascots within Imperial. Matters are not clear, but I have been in touch with the RSM Association, and we have agreed a way forward. We intend to approach Imperial to seek clarity and then consider how to move forward. The mascots are such an important part of Imperial's history and are dear to our hearts. We cannot therefore stand back and not ensure their maintenance for future generations of students.

Department representatives act as a link between Imperial and ourselves. They therefore have an important role within the Association. There are normally 2 representatives for each department, and we have vacancies in Aeronautics, Design Engineering and Mechanical Engineering and so if you are interested in involving yourself in the Association and are affiliated to these departments please get in touch.

We continue to try and involve the younger members of our community in our affairs, and I hope that we can do more in the coming year. I am certainly looking forward to the year ahead and to meeting as many of you as I can. Please do not hesitate to contact me if you have any thoughts or suggestions about events or how we can expand our community. I would be delighted to listen to your views.

PRESIDENTS REPORT

Paul Holmes

As the summer of 2024 fades into memory, it's time once again to welcome the start of a new academic year at the Royal School of Mines (RSM). This year, the fresh energy on campus is palpable, fuelled in no small part by the short summer break and the eagerness of both students and staff to dive back into their work. As I reflect on the months behind us, it is clear that the break was much needed but, as always, too brief.

Before I delve further into the life of the RSM and our Association, it's important to address one of the most significant events of the summer – the general election. The results came in earlier than many of us anticipated, catching much of the country off guard. It's fair to say that this election, originally expected at the end of this year, has redefined the political landscape in the UK. The impacts of these results will be felt across various sectors, including higher education and engineering. As we continue to navigate this new environment, the RSMA will remain committed to its mission, staying alert to any changes that may impact our students and alumni.

I must also take this opportunity to express my sincere and heartfelt thanks to the RSMA Committee members who continue to dedicate their time, energy, and expertise to keeping this Association thriving. Our simple goal has always been to foster an enduring link between members of the RSMA and the staff and students of the RSM, and to promote comradeship and mutual help. It's a goal that is no small feat, but thanks to the hard work of the Committee and its Executive roles, we continue to succeed. I cannot stress enough how much effort goes on behind the scenes to ensure that this Association remains relevant and vibrant, serving both our alumni and current students.

Supporting Alumni and Students Alike

A key component of the RSMA's continued success is our strong relationship with the College's Alumni Relations team. As a volunteer-led organisation, we rely heavily on their assistance in managing communication channels and keeping our members informed. Their systems and personnel are integral to our efforts, and the Committee is grateful for their ongoing support. The relationship we share with the College's administrative teams has grown into one of collaboration and mutual respect, allowing us to run the Association efficiently and effectively. This partnership also ensures that the feedback we receive from you, our members, is swiftly passed on to the Committee, allowing us to address any concerns or suggestions in a timely manner.

Continues overleaf…

DIARY

RSMA Toronto, Canada
Informal RSM meeting
Last Friday of every month, noon.
Jason George Pub,
100 Front Street East, Toronto
Contact: rsma.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
(20th Nov, 19th Feb, 21st May, 20th Aug)
Baron & Quail, Woodmead, Johannesburg, South Africa
Contact: Richard Gundersen – Gundersen@yebo.co.za

RSMA
139th Annual Dinner
Friday, 22nd Nov 2024, 7:00 for 7:30
Rembrandt Hotel, Sth. Ken. SW7 2RS

CGCA/RSMA
Traditional Reunion Luncheon
Saturday 23rd Nov, 12:30 for 13:00
Rembrandt Hotel, Sth. Ken. SW7 2RS
For all CGCA and RSMA members who graduated in a year ending in a '4' or a '9'.

CGCA
111th Annual Dinner
Friday, 14th Mar 2025, 18:45 for 19:30
Saddlers' Hall, 40 Gutter Lane, London EC2V 6BR
Booking form included with this issue.

Triodes reunion
Electrical Engineering class of 73
Saturday, 17th May 2025, 12:00-17:00
FiveSixEight, Beit Quadrangle
South Ken Campus

CGCA
AGM & President's Lunch
Saturday, 7th Jun 2025
Timing and venue TBD:

Great Exhibition Road Festival
Saturday 7th – Sunday 8th Jun
Exhibition Road
Free festival of arts and science led by Imperial College with other Albertopolis institutions.

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

The Friends of Imperial College regularly organise events of interest to alumni (see bit.ly/IE-FoI)

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

Paul Holmes, continued from page 3

RSMA 100 Club Final Year Student Bursary Prize

Turning to one of the highlights of the past year, I am absolutely delighted to report that the RSMA 100 Club Final Year Student Bursary Prize continues to be a resounding success. This year, we received a record 18 applicants, representing a diverse range of disciplines across the RSM. The bursary, now worth £1500, is awarded to students entering their final year in September 2024 and recognises those who embody the true RSM spirit. The award criteria are intentionally broad, allowing us to identify students who excel not just in academics, but also in other areas such as community involvement, RSM Union contributions, and sporting achievements. Financial hardship is also a factor we consider, as we aim to support students in a holistic manner.

This year, we are pleased to be awarding a minimum of three bursaries across the Earth Science and Engineering (ESE) and Materials departments, with the possibility of more depending on the quality of applicants. The selection process is underway, and we are working closely with the Department Directors of Undergraduate Studies to identify those deserving of the prize. The bursary is a testament to the generosity of our alumni, with funds raised through events and the incredible support of those who contribute to the 100 Club. I want to extend my personal thanks to each and every one of you who have given back to the current student body. Your contributions truly make a difference, and this prize is a tangible example of how former students of the RSM are helping the next generation.

The 100 Club continues to grow steadily, and I encourage anyone who hasn't yet signed up to consider doing so. It's an easy and impactful way to support the RSMA and ensure that we can continue offering these bursaries in the future. If you are already a member, thank you once again for your continued support. Please do take a moment to check that your banking details are up to date to ensure your contributions continue seamlessly. Your support is truly appreciated!

A Strong Relationship with the RSMU

Our relationship with the RSM Union (RSMU) remains as strong as ever. The association, was excited to support the RSMU to host a careers evening in March 2024, featuring six alumni from diverse fields, including Lithium-ion batteries, satellite imaging, and offshore wind. They shared their career journeys and job application advice with students. This event provided invaluable insights into various career paths and offered students and alumni opportunities for informal networking

I am delighted to introduce this year's RSMU President, Amelia Spindler, and Honorary Secretary, Anisa Price. They have already proven themselves to be dedicated and enthusiastic members of the RSMA Committee, and we look forward to working closely with them throughout the academic year. Their ideas and input are invaluable as we seek to further strengthen the ties between the alumni and student bodies, ensuring that the RSMA continues to serve as a vital link across generations of the RSM family.

Annual Dinner and Guest Speaker

As we look ahead to the social calendar, I'm pleased to announce that preparations for the RSMA Annual Dinner are well underway. This year's event will be held on Friday, 22nd November 2024, at the Rembrandt Hotel in Knightsbridge, and promises to be an evening to remember. The Annual Dinner is always a highlight in the RSMA calendar, offering alumni, students, and staff the chance to reconnect, reminisce, and celebrate the enduring spirit of the RSM.

We are particularly excited to welcome Dr. Susannah Maidment as our guest speaker this year. Dr. Maidment is a renowned palaeontologist and senior researcher at the Natural History Museum. Her work on dinosaur ecosystems and biomechanics is truly fascinating, and we look forward to hearing her insights. Please read on in this issue for more details about the event and a brief biography of Dr. Maidment.

Final Thoughts

As we embark on another year, I remain incredibly proud of what the RSMA has achieved and the strength of our community. Despite the challenges we may face – whether political, economic, or societal – the Royal School of Mines and its alumni stand together, connected by a shared history and a commitment to the future. I look forward to seeing many of you at the Annual Dinner and to another successful year of fostering the unique comradeship that defines the RSMA.

Thank you once again for your continued support. Let's make the 2024/25 academic year one to remember!

Your sincerely,
Paul Holmes
President, Royal School of Mines Association

Introducing Kelvin Higgins, CGCA's new president

I am Kelvin Higgins, a visiting professor in the Department of Civil and Environmental Engineering (DCEE) at Imperial and a Senior Partner of the Geotechnical Consulting Group LLP (GCG). As the name suggests, I am a geotechnical engineer, a discipline that is a fusion of geology and civil engineering, specifically engineering geology, rock mechanics and soil mechanics.

For those interested, Mike de Fretas and Mike Rosenbaum[1] summarise the development of engineering geology at Imperial and Joyce Brown[2] describes the development of the DCEE's soil mechanics section, from the time that Professor Pippard appointed Alec Skempton to start a research group in 1946 through to 1980.

The soil mechanics masters course started in 1950 under the umbrella of the City and Guilds College. A master's course in engineering geology was first offered in 1957 and a similar course in rock mechanics started in 1969. Both courses were offered within the Royal School of Mines. Traditionally postgraduate students (engineering geology, rock mechanics and soil mechanics) were taught together in both colleges but more recently the Geotechnics section of the DCEE teaches all 3 disciplines.

The Geotechnics Section at Imperial has consistently been at the forefront of research. This is apparent given the numbers of Rankine Lecturers associated with this group. The most recent of these is Professor Lidija Zdravkovic who gave the 62nd lecture. This Lecture is an annual event held at Imperial which is in the gift of the British Geotechnical Association. In alternate years it is given by an individual based in the UK and then an individual based overseas. It is truly an international event and most regard it as the pinnacle of their career. So far 25% of all lecturers have an association with Imperial and 40% of UK lecturers have the same association.

In my lecture at the Annual General Meeting, I gave two examples of the impact that the Geotechnics section had made.

The first of these was the "stabilisation of the leaning Tower of Pisa". A tower in Pavia collapsed in 1989 causing the death of 4 people. Imperial's involvement came through Professor John Burland being asked to join an Italian Government Commission following this collapse to study means of ensuring the safety of the Pisa Tower. A lot has been written about this work[3] but essentially the key to stabilising the tower was David Potts and John Burland being able to numerically reproduce the behaviour of the Tower. This allowed them to test different stabilisation measures. The solution that was implemented involved undermining one side to the tower thereby reducing the lean. To have straightened it would have destroyed a very lucrative tourist trade as anyone who has visited the site will know.

Photo: courtesy of Nico Siegl/Pexels

The second example was the investigation of the Carsington Dam collapse which occurred on 1st June 1984 while the dam's earth embankment was being constructed[4]. This was of particular interest to me because at the time I was in the early stages of my career designing similar structures albeit in more exotic environments. The investigation was undertaken by a team from Imperial led by Professor Sir Alec Skempton, Professor Peter Vaughan and Professor David Potts. There was a lot of field work, but computer simulations allowed the team to identify the failure mechanics and thereby advise on the reconstruction of a new embankment. It was this project that crystallised thoughts on progressive failure resulting from the degradation of soil strength with stain[5]. The reservoir was officially opened in 1992 and as far as we know it is still performing satisfactorily.

The firm that I work for, GCG, was founded by a group of individuals associated with Imperial and Cambridge University in 1983. Three of those involved in the formation of GCG were at the time members of staff at Imperial namely Dr David Hight, Professor David Potts and the late Professor Peter Vaughan. They were joined by the now Professor Lord Robert Mair. The aim was to apply the results of research to practical problems.

I joined the firm in 1986 having previously worked for Sir Alexander Gibb & Partners in the UK and overseas principally to work on the application of numerical models to practical problems. At the time numerical analysis applied to geotechnical problems was in its infancy. Geotechnical numerical analysis had to gain credibility and demonstrate its value. Leading the development of this form of analysis has been Professor David Potts and latterly Professor Lidija Zdravkovic, both currently members of the DCEE at Imperial.

Nowadays the use of geotechnical numerical analysis is widespread although it is debatable whether it is used wisely. As with any computer-based analysis the term "rubbish in, rubbish out" is certainly true. To help users understand the complexities of what they were doing I co-authored a document entitled "*Advanced numerical modelling in geotechnical engineering: Good practice guide*" which was published by the Construction Industry Research Association a couple of years ago. I just hope geotechnical analysts heed the warnings.

My interests have developed but I have maintained a strong interest in the use of advanced design methods to produce cost effective designs and methods of construction. Some of my most satisfying projects have been those where we have been able to assist contractors to modify designs or methods of working to be more efficient and cost effective. This goes back many years.

Perhaps the the standout project was a road scheme[6] where 3

analyses were able to demonstrate that the modification to a design could save 15% of the cost which at 1988 prices was in the order of £10m or around £35m today. More recently while working on the redevelopment of the Royal Artillery Barracks in St John's Wood we were able to eliminate all the above ground temporary works leading to massive cost and programme saving. Added to this there were significant improvements in terms of safety.

In the course of my work, I come across many examples of poor design brought about by designers not fully appreciating the processes and mechanism at play. One example involved the use of a large number of piles to stabilise a slope. Many considered that a better understanding of ground conditions would have allowed economies to be made. Of course, there may have been commercial pressures to produce a "safe" design but even so, this underlines the importance of education and the need for specialist courses such as those offered by Imperial. Whereas in my day these were fully funded courses sadly the same is not true today and there is little financial incentive to participate in these programmes.

Efficient designs along the lines of the two examples that I have given are essential if we are to address environmental concerns and reduce carbon emissions by reducing embodied carbon in construction.

In a recent talk, I used the WWI recruiting poster featuring Lord Kitchener and changed the slogan from "Your Country Needs You" to "Your Planet Needs You". I believe that we as engineers can make a significant contribution to the environmental challenges by making our designs and construction methods more efficiently resilient. This can only come about through education and a desire to address these issues. I hope that we can persuade others to act accordingly.

1 De Fretas M.H. and Rosenbaum M.S. (2008). Engineering Geology at Imperial College London:1907-2007, *Quarterly Journal of Engineering Geology and Hydrogeology*, 41, 223-228

2 Brown J. (1985) *A Hundred Years of Civil Engineering at South Kensington*. The Civil Engineering Department, Imperial College London. 1985. ISBN 0-85287-1505.

3 Burland J.B., Jamiolkowski. M., and Viggiani C. (2003). The stabilisation of the leaning tower of Pisa. *Soils and Foundations*. Vol. 43. No. 5, Oct. 2003. Japanese Geotechnical Society.

4 Skempton A.W. and Vaughan P.R. (1993). The failure of Carsington Dam. *Géotechnique*, 43, No. 1, 151-173

5 Potts D.M., Dounias G.T. and Vaughan P.R. (1990). Finite element analysis of progressive failure of Carsington embankment. *Géotechnique*, 40, No. 1, 79-101.

6 Higgins K.G. et al (1998) The benefits of using advanced numerical methods throughout the design and construction of a road scheme. *Proceedings of the AGS Seminar "The Value of Geotechnics in Construction"*, Institution of Civil Engineers, 4th November 1998, CRC, pp 101-113.

Early announcement/mark your diary

CGCA will hold their AGM/President's Lunch alongside the Exhibition Rd/Imperial Festival on Saturday, 7th June 2025. Venue details are yet to be fixed but will be close by College. Timings will allow members to attend the AGM and lunch and appreciate the splendours of the festival in Imperial and the museums. More details soon.

OLD CENTRALIANS' TRUST – REPORT OF THE TRUSTEES FOR THE YEAR 2022-23

This report covers the activities of the Old Centralians' Trust between 1st October 2022 and 30th September 2023.

LEGAL AND ADMINISTRATIVE DETAILS

The Trust is governed by a Deed of Trust dated 24th September 1965, amended on 1st June 1995, and is registered as an Educational Trust at the Department of Education under file number U.1725 ZZ/46. The Charity Commission Registered Number for the Trust is 1048552. The financial year of the Trust runs from 1st October each year.

TRUSTEES' REPORT

Object

The Old Centralians' Trust is a registered charity founded for the purpose of providing financial support to the students and, in special circumstances, members of the academic staff of the Faculty of Engineering of Imperial College, London (formerly known as the City & Guilds College).

The charity's overriding priority, as laid down in its founding deed, is to provide grants to students who face exceptional financial difficulties through no fault of their own.

In addition to this, grants are provided to assist individual students or groups of students who wish to travel to conferences, undertake sport or leisure activities, or broaden their minds through adventurous or challenging activities or projects. Such activities were valued by alumni when they attended College, and many bequests gave guidance on the type of activity their money should support.

Source of Funds

Fund-raising is not carried out in any formal sense. The income of the Trust arises from legacies, donations given in memory of former members of the City & Guilds College Association (an independent alumni body for students and staff of the former City & Guilds College, which now forms the bulk of the Faculty of Engineering at Imperial College, London), regular Gift-Aided contributions from alumni, and from the income and growth on investments accrued from these sources.

The Trust's investments are managed by a sub-committee of the Trust Board, who implement a strategy to meet the Trust's requirements of a target level of income whilst at the same time maintaining the underlying value of the investment portfolio. The strategy is reviewed from time to time by the sub-committee in consultation with their investment advisors, but in essence the approach taken is to take a long-term view, maintaining a sensible level of annual expenditure of around 3% of total reserves, leaving a balance to meet management costs and to provide for long-term growth to counter inflation. This approach allows cyclic fluctuations in the stock market to be viewed without undue concern.

During 2022-23, there were no bequests (21/22: £3,000). The General Fund received four modest donations totalling £30 (21/22: £286 from 7 donors). In addition to this, regular donations were received throughout the year for the benefit of the College mascot – a 1902 James and Browne motor car known as 'Boanerges' or 'Bo' for short. These were allocated to the Trust's restricted 'Ford Fund' and totalled £2,876.44 (21/22: £3,345) before gift aid, including one very generous donation of £1,000. From time to time, significant works are needed to Bo, and in this year an amount of £14,689 (21/22: £6,191) was awarded for a complete restoration of both chassis, including Bo's wooden wheels, and body.

Public Benefit

The trustees confirm that they have complied with their duty under Section 4 of the Charities Act 2011. They have considered the public benefit guidance published by the Charity Commission and believe that they have followed its guidance in this area. The trustees' report gives a description of the activities undertaken by the charity during the year in furtherance of its charitable purposes, and the trustees are satisfied that all such activities are in compliance with the stated objects of the Trust and that they provide a public benefit.

Results for the year

The Trust's finances have continued to be in a satisfactory state; the overall value of the investment portfolio rose during the year by 14.60% (21/22: minus 17.78%), almost bringing us back to the position at the end of our financial year 20/21.

At the conclusion of the financial year, the value of the Trust's investments stood at just over £3.8 million, an increase from £3.3 million a year earlier. It is the opinion of the trustees that the objectives of the trust can continue to be met for the foreseeable future.

The following were Trustees during the year:
Peter Chase (Chairman)
Christopher Lumb (Vice Chairman)
Professor Ann Muggeridge (College Consul for Engineering)
Dan Lehmann (Treasurer)
Nigel Cresswell (Hon. Secretary, City & Guilds College Association)
Andrew Hill (Hon. Treasurer, City & Guilds College Association)

Application Secretary: John Collins
Meetings Secretary: Colin Kerr

Registered Office: c/o City & Guilds College Association, Level 1, Faculty Building, Imperial College, London SW7 2AZ

Bankers: CAF Bank, 25 Kings Hill Avenue, Kings Hill, West Malling, Kent ME19 4TA

Asset Management: Management of the Trust's investments is carried out by an Investment Sub-committee of the Trust Board comprising Christopher Lumb, Peter Chase, David Law, Prof. Robert Schroter, James Fok and Allan Lee

Investment Advisers: CCLA, 1 Angel Lane, London, EC4R 3AB (from 4th August 2022), and Newton Investment Management, 160 Queen Victoria Street, London EC4V 4LA

Investment Custodians: CCLA, One Angel Lane, London, EC4R 3AB (from 4th August 2022), and Newton Investment Management, 160 Queen Victoria Street, London EC4V 4LA

Statutory Auditor: Haines Watts, 4 Claridge Court, Berkhamsted, Hertfordshire, HP4 2AF

OPERATIONS

I reported last year that the decline of the Covid pandemic saw a return towards normality. The current year has, indeed, seen that "normality" re-established, with typical applications returning to the levels seen pre-pandemic. Students engaged in overseas travel for expeditions and conference attendance, and the Trust distributed £45,125 (21/22: £45,347) in support of a broad range of student activities.

Hardship

There were several applications for hardship assistance received during 2022-23, with £8,255 awarded to seven students (21/22: £6,000 to three students). Some of these awards were for significant hardship assistance and made a very appreciable difference to the lives of the recipients, whilst others were to help replace damaged or lost personal IT equipment.

Statutory Awards

Engraved tankards and/or monetary awards were given to four students under the headings of: the Holbein Memorial Award; the Peter Moore Memorial Award; the John and Frances Jones Prize, and the 'Fellows of the City & Guilds of London Institute Centenary Award'. The last two of these named awards are funded by, respectively, the Imperial College Registry (which still maintains the original legacy fund given by John & Frances Jones in 1935) and the 'FCGI Witchell Fund' held within the Trust.

Student Activity Awards

These awards were once again offered, based on nominations submitted by Senior Tutors, to two undergraduate students in each of the ten Departments of the Faculty of Engineering. Whilst the maximum number of awards is therefore 20, the number given this year was only 12. We hope to have an improved number of nominees from the departments next year.

The awards of £800 each (an increase of £50 on last year) recognise the recipients' strong level of 'extra-curricular' involvement in student society affairs and/or in sporting or cultural activities. Students in their first, second or third year are invited to submit details of their level of involvement in extra-curricular activity to their Departmental senior tutor, who will then, in consultation with the Head of Department, nominate to the Trust the two students whose involvement has been judged to be the most deserving. The awards are issued at the commencement of the next ensuing academic year. The intent of these awards is to encourage undergraduates to make

the best of their time at university, and to help meet the inevitable extra costs of a more involved lifestyle, whether these costs be for accommodation, travel or to help with other associated expense.

John Elliott Bursaries

Under the John Elliott Bursary Scheme, named after a former Honorary Secretary and Chairman of the Trust, (Alfred) John Elliott, FREng, FCGI, FICE, FWeldI (who studied Civil Engineering between 1940 & 1942), awards totalling £3,150 (21/22: £3,300) were made to key officers of the City & Guilds College Union (CGCU), to assist with the personal costs involved in fulfilling their duties for the union. In recognition that some CGCU officers who don't receive such a bursary may nevertheless merit recognition, the Trust also supported 15 half-price tickets for CGCU officers to attend the CGCU Welcome dinner, 4 tickets to the CGCA Annual dinner, a CGCU officer training day and assistance with food and drink expenses for CGCU officers' meetings of £220. By the end of the year being reported, CGCU had claimed £1,210 (21/22: £631) of what was available to them under these extensions, plus the training day's cost of £1,770.

It is also worth mentioning under this heading, although provided from a different fund, that the Trust is prepared to support the Vice President of the CGCU during the summer months with a bursary of £2,500. This was not, however, taken up this year (21/22: £2,500).

Awards for Student Projects, Sporting activities, Adventure and Travel

The number of applications received for intrepid adventuring was very nice to see. These included expeditions to Bosnia, Finland, Norway, Slovenia, Switzerland, Tenerife and Yosemite in the US.

Of particular note was a project to test the practicalities of making sanitary pads for Rwandan women from banana plants. As part of the banana crop, surplus plant fibre can be used as the absorbent core, although there was then much complexity in packaging that using locally-sourced materials to produce a viable, overall product. Local women were recruited to test a machine made by Mechanical Engineering students in London, with a student travelling to Rwanda to run the overall project.

In total, the overall amount awarded this year, to fifteen applications, totalled £26,325 (21/22: 7 grants totalling £9,850).

Conference Travel for Postgraduates

Each year a certain proportion of budgeted funds go to support (mostly) postgraduate students in travelling to overseas conferences to present their research, whether by way of a poster display or a podium presentation. Suggesting the pandemic is well and truly behind us, during the year £18,800 was awarded to 41 students (compared to 21/22: £7,510 for 17) – an average travel grant of £458 (21/22: £442) per student.

GENERAL

As reported last year, the Trust switched some of its investment funds under management from St James Place to CCLA during FY21/22. In this first full year of their performance, we retained some CCLA investment as cash, given market volatility (which has, at the time of writing during FY23/24, now been switched into their general Charity Fund). Thus, for the whole of FY22/23, some 15% of what has been managed by CCLA was held in a "deposit" fund earning an APR of around 4%. Overall, CCLA's performance has been satisfactory, if not quite as good as Newton – who continue to provide excellent returns. The respective increases during the year have been 7.4% by Newton and 4.3% by CCLA.

ACKNOWLEDGEMENTS

The Old Centralians' Trust could not function smoothly without the freely given time of its officers and Board members, none of whom takes any remuneration or expenses. I would like to thank Vice Chairman Chris Lumb for his continued invaluable contributions, Professor Bob Schroter for his significant support in respect of hardship cases and Mr Colin Kerr for diligent management of our meetings. Particular mention and the sincerest of thanks go to Mr Dan Lehmann, Treasurer, and Mr John Collins, Applications Secretary, for their dedication to the continual stream of tasks that face them throughout the year. Many thanks also go to all our other Trust board members, especially for their input in reviewing the many applications we receive.

The Trust is also fortunate to have much valuable support from a large number of academic and administrative staff within the Faculty of Engineering, without which its work would be much less easy to fulfil. Grateful thanks are expressed to all those staff members who have been so generous with their time and advice.

The Board is pleased to have the expert services of Dux Advisory Ltd (formerly Messrs Haines Watts), of Aylesbury, Buckinghamshire, as advisers and as auditor of the Annual Accounts.

The Accounts and this report for the year 2022-23 were approved by the Board and Trustees on 2nd July 2024, and duly signed on their behalf by me, as Chairman.

Peter Chase
Chair, Old Centralians' Trust

End of Year RSMA Beer and Bite

Photos courtesy of RSMA

The end of year 'Beer and Bite' was held on 25th June. This year we moved to Eastside which proved to be an inspired choice.

With good weather as a bonus the group of RSM students and RSMA members were able to mingle not just indoors but outside too, enjoying Prince's Gardens and enabling a close-up inspection of Clem, which put in an appearance. Sadly the hoped-for 'Once around the Gardens' trips could not be held due to a minor defect in Clem's running gear.

Almost 40 people attended, with a good ratio of students to RSMA members enabling the youngsters to enjoy each other's company as well as chatting to the old-timers. We may have slightly underestimated people's appetites when it came to ordering the food (something to think about for next year!) but it was good and went down well lubricated, not least because of the friendly and attentive service from the bar staff, a real bonus.

There was a real spirit of camaraderie at this annual end of year event, and some 10 students signed up as RSMA Members which was an added bonus.

Feedback from the students was overall very positive, particularly as the 'reserve' Beer Tokens all seemed to find their way into circulation!

All in all a great event that the RSMA will be happy to run again in 2025. Watch this space.

CGCA AGM 2024

The CGCA Annual General Meeting (AGM) was held on Saturday, 8th June 2024 starting at 11:30 am in the Queen's Tower Rooms at Imperial College, South Kensington. This was break from the tradition of holding the meeting on a weekday evening.

The meeting was opened by Professor Atula Abeysekera who was standing in for Professor Anil Bharath. Anil was unable to attend due to College business abroad. Atula gave an overview of the last year's activities within the Association and the College.

He recognised that College had achieved second place in the world university rankings and had won 'University Challenge' for a record fifth time. He went on to thank Nigel Cresswell (Hon Sec), Peter Chase (OC Trust Chair and Reunion Organiser), Colin Kerr (Annual Dinner Organiser), Alison and Peter Buck for producing Imperial ENGINEER, and all the Committee for their efforts and support for the last year.

The next item was the Accounts for 2023 and Allan Lee joined by ZOOM to make the presentation. Due to a misunderstanding with the Accountants, the accounts were still in preparation so could only be reviewed in draft form. While the Association ran at a £13K loss during the year, investments more than covered this and stood at £180K. Haynes-Watts (now renamed Dux) were retained as Accountants.

Atula recorded an official vote of thanks for Anil, and then introduced Professor Kelvin Higgins who will be President for 24 – 25 and 25 – 26. Kelvin is an expert in geotechnical engineering and applying advanced numerical analysis to engineering projects. He is a visiting Professor at Imperial.

Kelvin took over the chair of the meeting and moved on to the election of officers for 24 – 25. Nigel Cresswell and Allan Lee were proposed and elected as Honorary Secretary and Honorary Treasurer respectively. The other officers were elected, as shown in the panel to the right.

After a few items of Any Other Business were handled, the meeting closed at 12:16.

Note: The combined members in attendance in person and by ZOOM did not reach the quorum as specified in the Articles of Association. Subsequently, the draft minutes were circulated to all members for which we hold an email address asking them to record any objections by 8th July 2024. No objections were received and hence the minutes were declared final.

Honorary Secretary: Nigel Cresswell
Honorary Treasurer: Allan Lee
Membership Secretary: Hayley Wong
Dep Hon Treas: James Prince
Younger Members Secretary: Tim Munday
Annual Dinner Event Manager: Colin Kerr
(Colin wishes to step down before the 2025 Dinner)
Decade Reunion Event Manager: Peter Chase
Managing Editor IE: Peter Buck
Representative on IC Exploration Board: Colonel Kevin Oliver
Departmental Representatives:
Aero Engineering: Hayley Wong
Bioengineering: Milia Hasbani
(Milia has since stood down from the Committee)
Chemical Engineering: Fatima Khan
Civil & Environmental Engineering: Colin Kerr and Tim Munday
Computing: James Prince
Design Engineering: vacancy
Electrical & Electronic Engineering: vacancy
Mechanical Engineering: Owen Heaney.

The day then moved on to a more social theme.

Kelvin gave a talk about Geotechnical Engineering, illustrating his points with projects that he has worked on. (This talk will be published later), and then members and guests enjoyed a BBQ and drinks in the sunshine on the Queen's Terrace. It was a splendidly social event, with age groups from current students to well post retirees mixing and chatting freely.

Nigel Cresswell
Hon Sec

Photo courtesy of Nigel Cresswell

Incoming CGCA President Kelvin Higgins gave a talk about Geotechnical Engineering

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

RAEng honours for Past CGCA Presidents

Dame Judith Hackitt, (Chemical Engineering, 72-75), CGCA President 2016-17, has received the highest medal awarded by the Royal Academy of Engineering, the President's Medal, in recognition of her enormous contribution to the work of the Academy. As a Trustee and Chair of the External Affairs Committee, Dame Hackitt has helped to shape the Academy's long-term strategy and fostered the launch of 'This is Engineering'; a campaign to encourage young people to consider engineering as a career. In her career, she has been President of the Institution of Chemical Engineers, a trustee of the City & Guilds Group and Chair of the Health & Safety Executive. At Imperial, she remains a trusted member of the Department of Chemical Engineering's Strategic Advisory Board (SAB), lending her academic experience in guiding and supporting the work of the department.

Dame Judith Hackitt said "I feel both proud and humbled to be the recipient of the President's Medal this year. Like many engineers, I do what I do because of my passion to make the world a better place, and it feels very special to be recognised for that."

Professor Atula Abeysekera (Civils 1980-83) has been elected as a Fellow of the Royal Academy of Engineering. Atula is a Professor of Practice (Risk Management) at the Department of Civil and Environmental Engineering and a Member of the Court of Imperial. He was CGCA President 2020-22.

A leading specialist in risk management, governance, stakeholder management and resilience, Professor Abeysekera is frequently consulted by government departments and academic institutions on growth strategies. With a Master's degree in civil engineering from Imperial, he has over 40 years' experience and expertise in systems risk management with global financial institutions. He teaches civil engineering students at Imperial and is the first Professor of Practice in the department's 145-year history.

Professor Abeysekera is a member of the Advisory Board of the Centre for Systems Engineering and Innovation at the Faculty of Engineering at Imperial. In recognition of his commitment to young people, teaching and mentoring, in 2017 Atula was awarded a Fellowship by the City & Guilds Institute.

He is recognised by the Academy as Honorary Fellow, an honour awarded to individuals who have made exceptional contributions to engineering, but who may not themselves be practising engineers or engineers qualified for election as Fellow.

Professor Abeysekera said: "I am deeply humbled to have been elected as an Honorary Fellow of the Royal Academy of Engineering. This prestigious recognition not only acknowledges my personal journey and contributions to the field of risk management but also highlights the collective efforts of my research teams and collaborators over the years. This Fellowship is a testament to the hard work, innovation, and commitment we have consistently demonstrated in addressing complex systems and advancing risk management strategies globally.

"For me, this recognition reinforces the importance of continuing to push boundaries in risk management and governance. It motivates me to contribute even more to mentoring the next generation of engineers, fostering resilience and adaptability in today's rapidly changing world."

Along with Atula, three other Imperial academics were elected as Fellows, bringing the total number of Imperial Fellows to 113. Becoming a Fellow of the Royal Academy of Engineering is one of the highest honours that engineers can receive in the UK.

https://dub.sh/IE41-RAEng-Prizes
https://dub.sh/RAEng-Fellows

RAEng Fellows elected

Alongside Professor Atula Abeysekera (see previous column), Professors Geoffrey Li, Robert Zimmerman and Jonathan Morrison have been elected Fellows of the Royal Academy of Engineering.

Professor Nigel Brandon, Dean of the Faculty of Engineering, said: "Huge congratulations to Professors Li, Zimmerman, Morrison, and Abeysekera – four of our leading engineers who are helping to shape the world. I am very proud of the contribution they are making as part of our Engineering community, enabling Imperial to scale the impact of new discoveries, inventions and ideas, and position us as a trusted convenor and partner for knowledge. I offer each of them my personal congratulations on this recognition of their achievements."

Dr John Lazar, President of the Royal Academy of Engineering, said: "Our new Fellows represent some of the most talented people in the world of engineering and are taken from the ranks of those who are aiming to address some of our most critical problems."

Professor Geoffrey Li is Chair in Wireless Systems and Director of the Intelligent Transmission and Processing Laboratory (ITP Lab) at the Department of Electrical and Electronic Engineering.

He is recognised for his outstanding contributions to wireless signal processing, transmission and standardisation – in particular for resolving many fundamental issues in orthogonal frequency division multiplexing (OFDM), which enabled OFDM to be used in devices requiring wireless communications such as computers, smartphones, digital audio and video broadcasting. These solutions are now ubiquitous, having found their way into every communications standard. He also won the 2024 IEEE Eric E. Sumner Technical-Field Award for fundamental contributions to frequency domain communications including OFDM.

Professor Li said: "I am delighted to have been elected a Fellow of the Royal Academy of Engineering, joining a group of leading figures in the field of engineering and technology. I feel so lucky to have joined Imperial four years ago. I greatly appreciate the support from the colleagues at Imperial, in particular Professor Tony Constantinides, Professor Eric Yeatman, and Professor Kin Leung."

Photos courtesy of Imperial College London

Professor Robert Zimmerman is Chair in Rock Mechanics at the Department of Earth Science and Engineering.

He is a leading expert on the mechanical behaviour of fluid-saturated porous media. His research focuses on the hydromechanical behaviour of fractured and porous rocks, petrophysics, fluid flow in porous media, rock failure and fracture, and on the relationship between microstructure and the physical properties of heterogeneous materials, with applications in petroleum engineering, underground mining, radioactive waste disposal and subsurface carbon sequestration.

Professor Zimmerman's models for rock failure and borehole stability are used throughout the energy industry to help prevent boreholes from collapsing.

He said: "Providing safe, clean and affordable energy is one of the main challenges facing the world. I am deeply gratified that my contributions in this area have been recognised by the Royal Academy of Engineering. I look forward to continuing to work on various aspects of subsurface energy technology, and to work with the Academy to promote the profession of engineering within society."

Professor Jonathan Morrison is Chair in Experimental Fluid Dynamics at the Department of Aeronautics.

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

His multidisciplinary research focuses on the fundamentals of turbulent flow and the instabilities that define the 'route to chaos' and turbulence.

Recent experiments aim to reduce drag, energy loss and emissions in fluid-based systems. His approach uses an innovative blend of smart materials, modern control theory and fluid mechanics to control fluid flow and improve the efficiency of fluid-based systems, especially for the reduction of drag, and therefore emissions, in the transport sector.

Professor Morrison founded and established the National Wind Tunnel Facility, a group of 22 strategically important wind tunnels distributed across 12 universities that facilitate research across academia and industry. This innovative idea solved the problem of under-investment in UK wind tunnels by establishing an equitable, excellence-based framework for tunnel membership.

He is also a Royal Society Industry Fellow, collaborating with QinetiQ on reducing drag for new airframe designs.

He said: "Fluid flow is ubiquitous, from animals and humans to the ocean and the atmosphere. Experiments in fluid flow are so important because they help to improve our understanding of these systems, especially if the boundary conditions are complex. These experiments are becoming increasingly sophisticated, requiring a range of expertise and collaboration. It's an honour for our work to be recognised by this fellowship and it is really an award for all the wonderfully talented experimentalists with whom I have had the privilege to work over the years."

https://dub.sh/RAEng-Fellows

Photos courtesy of Imperial College London

Professor Jason Hallett

Researchers awarded RAEng prize

Two Imperial researchers have been awarded top honours by the Royal Academy of Engineering in its 2024 prize awards.

The Royal Academy of Engineering aims to harness the power of engineering and technology to address the challenges of our age. Each year, it makes a range of awards that recognise the outstanding contribution made to society by engineers at every stage of their career.

Professor Jason Hallett in the Department of Chemical Engineering was awarded a Princess Royal Silver Medal for his "incessant pioneering spirit" in developing environmentally friendly and economical solvent-based chemical processes for large-scale industries including renewable chemicals, textiles and cosmetics. The Princess Royal Silver Medal is for engineers with fewer than 22 years employment.

Professor Hallett's research has led to the spinout of seven UK-based technology companies. His work has attracted over £15 million funding and his businesses currently operate from pilot to commercial scale, reducing chemical usage, waste and carbon emissions.

He founded the company Lixea to process toxic wood waste in an environmentally friendly way. Traditional methods rely on preservatives that include heavy metals, and burning this waste wood leads to environmental contamination, meaning that over two million tonnes of wood waste is sent to landfill every year in the UK alone. Lixea's patented process uses liquid salts or ionic liquids as low-cost, environmentally friendly solvents to break the wood down safely and separate its components, enabling this expensive waste material to be converted into a valuable bioenergy resource.

Commenting on his award, Professor Hallett said: "I am thrilled! My research group has worked exceptionally hard to try and prove that chemical processes can achieve both environmental and economic goals and we have been actively translating these research ideas into the commercial sector and forming an array of spin-outs. It's an honour to see these efforts recognised!"

Dr Alalea Kia, Advanced Research fellow in the Department of Civil and Environmental Engineering was named overall winner of the Young Engineer competition and received the prestigious Sir George Macfarlane Medal for developing a permeable concrete pavement that can help soak up flood water. She was one of five Young Engineers of the Year, each winning a prize of £3,000. The Young Engineer of the year awards are for those who graduated less than ten years ago

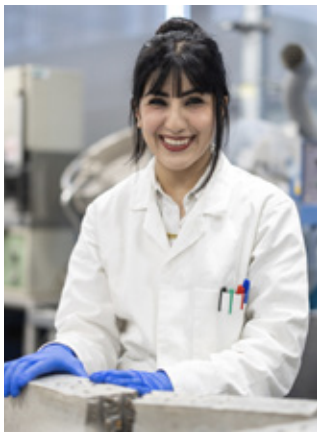
Her permeable pavement, called Kiacrete, helps to mitigate the devastating impact of urban flooding by absorbing storm-water. Its porous structure and use of recycled materials means manufacturing it produces fewer carbon emissions than standard cement alternatives, resulting in a saving of at least 23 tonnes of carbon per kilometre for a single carriageway road. It has the potential to be used across the built environment, from footpaths to airports.

Dr Kia said: "I am deeply honoured and humbled. These awards provide credibility and recognition for my career and research and help to raise the profile of early career female engineers. They also highlight the importance of the climate emergency and the urgent need to develop climate change resilient infrastructure for a more sustainable future."

Dr Kia won a Research Fellowship from the Royal Academy of Engineering for her work in 2021 and is also a UKRI Future Leaders Fellow with a significant track record in the professional and personal development of colleagues and students through outreach and mentoring.

Professor Hugh Brady, President of Imperial College London, said: "Through their ingenuity, dedication and drive, these Imperial researchers are being recognised for their bold scientific solutions that are ready for commercial use. All are worthy winners of these prestigious Royal Academy of Engineering awards and I congratulate them for their achievements and their contribution to society."

https://dub.sh/IE41-RAEng-Prizes



Dr Alalea Kia

Medals for Dean

Professor Nigel Brandon, Dean of the Faculty of Engineering and Professor of Sustainable Development in Energy, has recently been awarded two medals.

He was awarded a Christian Friedrich Schönbein Gold Medal of Honour at the European Fuel Cell Forum 2024, an international meeting on solid oxide science, technology and implementation.

The award recognises outstanding contributions to the advancement of science and technology. Professor Brandon's award recognises his outstanding scientific contribution to solid oxide technology.

Professor Brandon attended the award ceremony on Friday 5 July in Lucerne, Switzerland. He delivered a keynote lecture on the topic 'From bench to business – innovations in solid oxide cell and stack technology.'

On receiving his award, Professor Brandon said: "It was a real privilege to be following in the footsteps of my colleagues Brian Steel and John Kilner, as a recipient of this award, and my thanks go to the many students and colleagues in both academia and industry with whom I have had the pleasure of working since I graduated from Imperial College with my PhD some 40 years ago".

Professor Brandon was also awarded the Castner Medal by the Electrochemical Technology Group of the Society of Chemical Industry.

He is the 24th recipient of the Medal since it was first awarded in 1947. His award was given in recognition of his research in electrochemical technologies for the low carbon energy transition. He is the founder of three companies in the sector: Ceres Power, RFC Power and M-SPIN. The award was given at a ceremony in Manchester.

The award is named after Hamilton Castner, best known as a pioneer in the field of industrial electro-chemistry. The Society of Chemical Industry was formed in 1881 by prominent scientists, inventors and entrepreneurs of their day, who went on to form products, processes and companies that propelled society forward.

https://dub.sh/IE41-Dean-Medal
https://dub.sh/IE41-Dean-Castner

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

King's Birthday Honours for Imperial Academics

Leading Imperial researchers from across the university have been recognised in the latest King's Birthday Honours List.

The 2024 list, released as part of the King's Official Birthday celebrations in June, honours six members of the Imperial community for their achievements in the field of science and research.

Emeritus Professor Jim Skea of the Centre for Environmental Policy, and Chair of the Intergovernmental Panel on Climate Change, receives a knighthood for services to climate science.

Professor Washington Ochieng, Head of the Department of Civil and Environmental Engineering at Imperial, is awarded a CBE for services to global positioning and navigation systems.

Professor Ian Walmsley, Provost of Imperial College London, is awarded a CBE for services to science and to quantum technologies.

Professor Jonathan Weber, Director of the Imperial College Academic Health Science Centre, is awarded a CBE for services to global medical science.

Professor Jane Davies, Professor in Paediatric Respirology & Experimental Medicine at the National Heart and Lung Institute, is awarded an OBE for services to people with cystic fibrosis.

Professor Anthony Gordon, Head of Division of Anaesthetics, Pain Medicine and Intensive Care, is awarded an MBE for services to critical care medicine.

Photos courtesy of Imperial College London

James 'Jim' Skea is an Emeritus Professor at the Centre for Environmental Policy, and Chair of the Intergovernmental Panel on Climate Change (IPCC). He has undertaken research on climate and energy for over forty years, supporting action to ensure access to energy and avert climate change in a way that benefits humanity.

Much of that work has been undertaken at the IPCC, which he began contributing to shortly after its formation in the 1990s. He was Vice-Chair and then Co-Chair of Working Group III, which covers the mitigation of climate change, through methods for reducing emissions of greenhouse gases and enhancing sinks that remove them from the atmosphere.

Professor Skea co-led the landmark IPCC report on global warming of 1.5°C, which led to a step change in global climate action by triggering net zero targets covering 90% of global emissions. He also co-led the flagship 2022 report on climate change mitigation, providing a blueprint for mitigating emissions that has informed accelerated commitments in the UN, G20 and beyond. He was a founding member of the UK Climate Change Committee responsible for advising government on progress to net zero.

In July 2023 he was elected as the first UK Chair of the IPCC. He was awarded an OBE for services to sustainable transport in 2004, and a CBE for services to sustainable energy in 2013.

On his knighthood, he said: "I am humbled to have been honoured in this way. But it also reflects the huge voluntary efforts undertaken by the thousands of IPCC authors who have dedicated themselves to providing solid scientific evidence to support climate policy. This is for them too."

A pioneer of Europe's satellite-based global positioning and navigation systems, **Professor Washington Otto Ochieng's** research covers positioning, navigation and timing (PNT) system design and application on water, land, air and space. His research portfolio also includes infrastructure security and resilience, and user-centric mobility. As well as his research, he also advises the UK government on related policy.

A Fellow of the Royal Academy of Engineering, Professor Ochieng is the Head of Imperial's Department of Civil and Environmental Engineering, Chair in Positioning and Navigation Systems, and Director of Imperial's Institute for Security Science and Technology (ISST).

His work has contributed to areas as diverse as space navigation, intelligent transport systems in cities, and navigation aids for blind people. His research has made significant contributions to major international projects, including the design of the European Geostationary Navigation Overlay Service and GALILEO, measurement error modelling in Global Navigation Satellite Systems, and the specification of aircraft trajectory management tools for the Single European Sky's ATM Research programme.

His achievements are highly recognised globally, including in his native Kenya, where in 2022 he received the honour of Elder of the Order of the Burning Spear – one of the country's highest national decorations – from Kenyan President Dr William Ruto.

Professor Ochieng said of his CBE: "I receive this Honour from HM the King with deep gratitude and humility. It recognises the work of many wonderful colleagues and entities that I have worked and collaborated with over many years in academia, industry, government, non-governmental organisations and wider society."

"I give special thanks to my former and current PhD and Post-Doctoral researchers who have worked tirelessly with me, leading to this Honour. It is particularly pertinent at this very juncture as we work with the UK government to implement its 10-point plan on the UK's Resilient Positioning, Navigation and Timing Capability."

Professor Ian Walmsley has held the role of Provost of Imperial College London since 2018 and is an internationally recognised expert in ultrafast and quantum optics. His research has led to advances in fields as diverse as spectroscopy, cryptography, quantum computing, and precision measurement.

In his role as Provost, he leads the academic mission of Imperial, overseeing its research, education and innovation and translation activities. His role includes both strategy and planning, ensuring that resources are aligned with the strategic aims of the university's plan.

As Chair in Experimental Physics, he remains an active researcher in quantum information processing using light, including quantum computing and simulation, sensing and networking, and he leads a research group at Imperial in this area. He is also one of the co-founders of ORCA Computing, a quantum computing startup company.

In recognition of his contributions to quantum optics and ultrafast optics, Professor Walmsley was elected a Fellow of the Royal Society in 2012. He is also a Fellow of the Institute of Physics, the American Physical Society and the Optical Society of America (now Optica), of which he was President in 2018.

On his CBE, Professor Walmsley said: "I'm really moved by this honour and very pleased to have been nominated. I've been fortunate to be inspired by amazing colleagues and students across many institutions throughout my scientific career: it has been a privilege to have had the opportunity to work with them in such exciting fields as quantum technology, as well as in the broader work of research and education. I'm also deeply grateful for the long support of my family."

Professor Jonathan Weber is a renowned HIV/AIDS researcher and has been working for over 40 years looking after and researching treatments for patients with HIV and AIDS.

Professor Jane Davies is Professor of Paediatric Respiratory Medicine and Experimental Medicine at Imperial College London and an Honorary Consultant at the Royal Brompton Hospital, part of Guy's & St Thomas' Trust. She has been at the forefront of revolutionising treatments for people with cystic fibrosis (CF), focusing on designing and leading global clinical trials for groundbreaking 'CFTR modulator' drugs that target the genetic causes of the disease.

Professor Anthony Gordon is Chair in Anaesthesia and Critical Care at Imperial, as well as an Intensive Care consultant in St Mary's Hospital, an NIHR Senior Investigator and a Fellow of the Academy of Medical Sciences. His work in critical care has focused on severely ill patients with sepsis, leading innovative clinical trials to improve care, and developing personalised treatment approaches, including the use of novel diagnostics and artificial intelligence to adapt treatment strategies.

https://dub.sh/IE41-Honours

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

Awards for Materials Professors Grimes and Kilner

Photos courtesy of Imperial College London

Professor Sir Robin Grimes FRS FREng has been awarded the 2024 Robert Cahn Award ahead of the Nuclear Materials Conference. The award recognises an outstanding scientist who has a high scientific profile in the field of nuclear materials, the ability to communicate science to a broad audience and who has demonstrated interest in breaking down barriers between different scientific disciplines.

Professor Grimes is a Professor of Materials Physics in the Department of Materials at Imperial College London and BCH Steele Chair in Energy Materials. He is a Fellow of the Royal Society, the Royal Academy of Engineering and was knighted in 2022.

Between 2013 and 2018, he held the position of Chief Scientific Adviser to the Foreign & Commonwealth Office. From 2017 to 2021, he worked as Chief Scientific Adviser (nuclear) to the UK Ministry of Defence.

His research uses static and dynamic atomic scale computer simulation techniques to predict the behaviour of materials for energy applications including nuclear fission and fusion, focusing on fuel and waste performance.

To celebrate the award, Professor Grimes was invited to give a plenary lecture at the Nuclear Materials Conference in Singapore in October 2024.

Professor John Kilner has received the Senior Scientist Award at the 24th Solid State Ionics 2024 conference, the highest award of the ISSI. The conference was held in London with over 600 international attendees.

Professor Kilner is currently a Senior Research Investigator in the Department of Materials, having retired as B.C.H.Steele Professor of Energy Materials. He is a former head of the Department of Materials (2000-2006) and a former Dean of the RSM (1998-2000).

Professor Kilner is also a Professor in the International Institute for Carbon Neutral Energy Research I2CNER at Kyushu University in Japan. Additionally, he has acted as a scientific advisor to CICenergiGUNE (Basque energy research centre) in Vitoria-Gasteiz, Spain and also acted as the group leader for ceramic electrolytes.

He has been involved in research into ionic and mixed conducting ceramics for 30 years and has published over 500 papers. He is also the holder of a number of patents relating to fuel cells and gas separation devices and the co-founder of a successful spinout company CeresPower Ltd.

https://dub.sh/IE41-Mat-Awards

Imperial is still UK's top university

Imperial has been named as the UK's top university for the second year in a row in the Daily Mail's University Guide.

Imperial was praised for the quality of its research and employment outcomes for students, with the university coming top across all three measures for graduate employment. The University Guide also highlighted Imperial's 'strong social conscience' and praised the university for having 'one of the most progressive bursary programmes in the UK'.

The league table measures universities against 12 key performance indicators, including teaching excellence, student experience and support, research quality and the proportion of first-generation students.

Professor Hugh Brady, President of Imperial, said: "This recognition reaffirms what makes Imperial special – our STEMB focus, groundbreaking research, and vibrant London location make Imperial an inspiring place to work and study. Every day, our talented staff and students demonstrate the power of innovation and a deep commitment to solving real-world challenges. They can be proud that they're using their talents to address some of the world's biggest challenges and shaping a better future for humanity."

https://dub.sh/IE41-TopSpot

Rosalind Franklin Award for Dr Jess Wade

Dr Jessica Wade, from the Department of Materials, has been awarded the Royal Society's Rosalind Franklin Award and Lecture for her achievements in functional materials and her outstanding project which will support early-career women scientists to pursue academic careers in materials sciences.

Dr Wade is a Royal Society University Research Fellow and Lecturer in Functional Materials.

Her research considers new materials for optoelectronic, spintronic and quantum devices, with a focus on chiral molecular materials. Dr Wade is on the Management Board of QuEST, Imperial's Centre for Quantum Engineering, Science and Technology, co-lead of the Materials for Quantum Network Spin and Topology Group and Chair of SPIE's EDI committee.

Outside of the lab, she is involved with several science communication and outreach initiatives. She is committed to improving diversity in science, both online and offline, and since the start of 2018 has written the Wikipedia biographies of women and scientists of colour every single day.

Dr Wade said: "There's no part of this that isn't incredible: to be recognised by the Royal Society, to win an award honouring the legacy of Rosalind Franklin, to secure the funding to develop training programmes for early career scientists. I'm beyond thrilled."

She credits her own success to the support she has had from across the university, saying: "There's no way I would be where I am without the support of Prof Sandrine Heutz, who mentored me through my Imperial College Research Fellowship and inspires me as Head of Department.

"I was also lucky enough to be trained by Matt Fuchter, Alasdair Campbell, Simon Foster, Lesley Cohen and Ji-Seon Kim – Imperial is full of fantastic science, and fantastic scientists: we're very lucky. I think all early career researchers should have the same opportunities to succeed as we get at Imperial."

https://dub.sh/IE41-RS-awards

Royal Society Prize for Prof. Dame Molly Stevens

Professor Dame Molly Stevens, has been awarded the Royal Society's Armourers and Brasiers Company Prize, recognising her achievements in pioneering nanomaterials for ultrasensitive disease diagnostics and advanced therapeutic delivery for the benefit of individuals and society at a global level.

Professor Stevens is now based at University of Oxford but still holds a part-time professorship in Imperial's Departments of Materials and Bioengineering. Her research is centred on understanding and designing the interface between materials and biological systems to develop materials-based solutions for regenerative medicine, diagnostics, and therapeutics. This includes designing biomaterials that elicit tissue regeneration, creating controlled drug delivery systems to target disease sites and reduce systemic side effects, and developing ultrasensitive biosensors for early disease detection. A key aim is to develop flexible, effective, and more accessible tools that do not rely heavily on complex equipment or trained personnel, making them usable even in the most resource-limited settings.

A major driver for her work is to design innovative solutions that will be accessible to broad populations, by working with people in the field to maximise impact.

Professor Stevens said, "I am delighted to receive this award which recognises the dedication and creativity of my amazing team of researchers and students. Our wonderful interdisciplinary team is very motivated to keep working towards transformative healthcare technologies that are accessible to all."

https://dub.sh/IE41-RS-awards

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

Ada Lovelace Academy

The Ada Lovelace Academy is a new flagship initiative consisting of an integrated suite of computational MSc programmes at the Department of Earth Science and Engineering (ESE).

With a focus on data science, machine learning, and artificial intelligence, the Ada Lovelace Academy recently launched with the aim of delivering gender-balanced postgraduate education to solve the science and engineering challenges of the 21st century.

Named after Ada Lovelace – the first ever computer programmer – the Academy is committed to addressing the historical under-representation of women in the engineering and technology sectors by educating a gender-balanced cohort of scientists and engineers.

"To underline our commitment to gender equality, we will offer Ada Lovelace scholarships to encourage more women into computational disciplines within Earth science and engineering, as well as mentoring opportunities and access to networking events and industry placements," said Dr Rossella Arcucci, Senior Lecturer in Data Science and Machine Learning at ESE and Director of the Ada Lovelace Academy.

Currently, the Department is educating 269 students across its computational MSc courses, with women making up 42% of the student body.

By 2030, the Ada Lovelace Academy aims to achieve gender equality in all its MSc programmes.

"The Ada Lovelace Academy is driven by our commitment to creating an inclusive and diverse environment. This is reflected by the fact that half of our course directors for the Academy are women," said Professor Tina van de Flierdt, Head of ESE.

"Currently based in the Royal School of Mines, the Ada Lovelace Academy will eventually be housed at Imperial's White City campus – an emerging hub for interdisciplinary innovation and research – and will align with the new Schools of Convergence Science for Human and Artificial Intelligence and Sustainability."

Once fully established, ESE's Ada Lovelace Academy will welcome additional MSc courses from across Imperial which align with the Academy's focus areas and with its commitment to achieving gender balance.

"The Ada Lovelace Academy will be instrumental in creating the pathways and support systems to ensure women and under-represented groups feel empowered to develop the skills needed to address the complex science and engineering challenges of the 21st century," said Professor Martin Blunt, Professor of Flow in Porous Media at ESE, and Course Director of one of the MSc programmes that is part of the Ada Lovelace Academy.

https://dub.sh/IE41-Lovelace

ChemEng Enterprise Day

This event included an update on spinouts that have arisen out of the Department of Chemical Engineering in the last few years, and presentations from pipeline teams working on new launches.

There was an excellent turnout, with 66 in-person early-stage investors, accelerators, alumni/mentors, spinout members and senior Imperial Enterprise commercialisation professionals, in addition to 47 remote attendees.

The day kicked off with networking and poster presentations from the department's strong research community, showcasing spinoffs currently in the pipeline. Topics ranged from thermo-stable vaccine delivery technology (AlphaVectors Biotech, presented by Apanpreet Kaur), critical materials recovery (Vanadion, by Amir Mohammad Dezashibi), high performance membranes for batteries and energy storage (IonMem, by Qilei Song) and much more, with a keen level of interest shown by investors.

Attendees were given updates on the progress of recent spinoffs. These included, amongst others, DyeRecycle, that offers a unique low-cost circular model for the extraction, recovery and recycle of dyes and fibres in the textile industry; Bioataraxis, a green solution technology providing sustainable, bio-based surfactants for cleaning products and industrial applications; Quaisr, offering a cloud technology platform than enables companies to easily build and distribute reliable digital twins of their assets and processes.

Translating scientific discovery and research results into applied solutions is not easy, but the Department has a rich track record of translating its innovative research into successful deep-tech companies, including Process Systems Enterprise, the top exit from Imperial in the last 20 years (and one of the top 10 exits from any UK university in the last decade).

https://dub.sh/IE41-ChemEntDay

Analysing speech interruptions to help chatbots

Data scientists at Imperial have developed an audio dataset of speech interruptions to enhance chatbots and gain insights into human linguistics.

In a new study, published in *Data*, Daniel Doyle from Imperial's Department of Computing and Dr Ovidiu Serban from the Data Science Institute explored the notoriously ambiguous area of human speech interruptions. Daniel carried out this research as part of his MSc studies in the Department of Computing.

As defined in their study, an interruption is an instance where an interrupting party intentionally attempts to take over a turn of the conversation from an interruptee and in, doing so, creates an overlap in speech.

Until now, there has been a lack of publicly available audio datasets specifically for studying interruptions, which has made it difficult for researchers to develop effective models.

Through identifying and manually annotating over 500 interruptions from a recording of a group meeting, the pair of researchers were able to build a comprehensive dataset that includes both audio files and transcripts.

This work not only contributes to the field of computational linguistics but also opens new avenues for improving chatbot interactions by enabling computer models to better recognise and respond to interruptions in real-time, thereby creating more natural conversational experiences.

Audio-based datasets are historically lacking due to the complexities in transcribing speech, a lack of high-quality data and limited access to resources.

Yet audio datasets are important for a variety of reasons; from improving machine learning models and chatbot interactions, to advancing research in communication and human interaction.

In particular, previous methods for detecting interruptions in conversations were either based on artificial data or were slow and inefficient. Previous techniques took a long time to analyse speech, which made it difficult to quickly identify interruptions during a conversation.

To address these challenges and to compensate for the lack of publicly-available data on speech interruptions, the team at Imperial created a new dataset for interruption classification using the GroupAffect and Performance (GAP) dataset curated from the University of the Fraser Valley in Canada.

The GAP dataset consists of 28 group meetings, totalling 252 minutes of conversational audio. The nature of these discussions welcomed frequent interruptions which made the setup of the GAP dataset ideal for creating a new dataset for interruption classification.

From this broader dataset, the researchers extracted 200 manually annotated interruptions from a total of 355 overlapping utterances, categorising them into true and false interruptions.

The dataset created by Mr Doyle and Dr Serban helps in creating chatbots capable of distinguishing between interruptions, back-channels, and background noise and categorising overlapping speech into two classes: true interruptions and false interruptions.

False interruptions refer to overlapping speech that does not constitute genuine interruptions. These may include backchannel responses where the listener is engaging without attempting to take over the conversation.

Backchannels, which include affirmations like "agreed" or "mhmm," are responses from listeners that do not interrupt the speaker. By accurately identifying these distinctions, the dataset allows for more natural pauses in conversation, leading to interactions that feel more human-like.

Whereas true interruptions are instances where a speaker intentionally takes over the conversation, creating an overlap in speech with the current speaker. These interruptions are characterised by the intent to dominate the conversation or change the topic, often leading to a disruption in the flow of dialogue.

According to Dr Serban, "By focusing on the intention behind the interruptions and distinguishing them between 'true' and 'false', we were able to provide a precise definition for an interruption – something that was previously difficult to clearly define."

He added: "By publishing this new dataset, we are starting to democratise the research opportunities in human-computer interaction and human activity recognition in a field that has always been restricted to large tech companies working on voice assistants and voice models. This is the first openly available and, hopefully, not the last dataset to support this research area.".

https://dub.sh/IE41-Interrupt

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

Imperial co-launches UK centre for tasty, affordable meat alternatives

Imperial has co-launched the National Alternative Protein Innovation Centre (NAPIC) to develop tasty, planet-friendly animal protein alternatives.

The UKRI Biotechnology and Biological Sciences Research Council (BBSRC) and Innovate UK have invested £15 million into the Centre, which will be directed by the University of Leeds and co-led by Imperial College London, the James Hutton Institute and the University of Sheffield.

More than 100 UK and international stakeholders including the academic partners have also committed £19.3 million of co-investment and support in addition to UKRI's £15 million.

NAPIC aims to bring alternative proteins – proteins derived from non-animal agriculture sources – into the mainstream to support Net Zero goals and futureproof food and animal feed security in the UK.

Professor Karen Polizzi, from Imperial's Department of Chemical Engineering, will lead Imperial's input. Her focus will be to sustainably accelerate the production of alternative proteins.

Professor Polizzi said: "Transitioning to healthy, sustainable sources of protein is a pressing global challenge.

"The National Alternative Protein Innovation Centre will help facilitate this transition by supporting researchers and industry in all parts of the process from product design through to consumer acceptance. At Imperial, we will focus on developing economical, sustainable processes for producing newly discovered alternative proteins on a large scale."

Professor Polizzi is also Vice Director of Imperial's Bezos Centre for Sustainable Protein. While the Bezos Centre focuses on applying engineering biology and AI to accelerate the development of tasty alternative proteins, NAPIC will focus on a range of approaches that help them to become mainstream in the UK.

NAPIC project leader Professor Anwesha Sarkar said: "NAPIC will provide a robust and sustainable platform for open innovation and responsible data exchange and collaboration with partners from industry, regulators, academic partners and policy makers that mitigates the risks associated with this emerging sector, and also addresses the short- and longer-term concerns of consumers and producers."

The 'alternative proteins' under development are edible proteins that are derived from sources other than animal agriculture: from plants such as cereals, legumes, tubers and nuts; fungi such as mushrooms; algae such as seaweed; insects; proteins derived via lab-grown microbial cells or fermentation; and lab-grown meat.

Protein is essential to human health; without it our cells, tissues and organs can't function. Animals obtain protein through what we eat, including both animal and plant sources, such as meat, eggs, fish, nuts and legumes such as beans. However, producing animal-based protein requires extensive land use and generates significant greenhouse gas emissions. As the global population expands, the health of humans, animals and the planet are increasingly dependent on widespread availability of proteins that taste good and are produced in ways that reduce emissions and the impact on nature.

Photo courtesy of Pexels/Vanessa Loring

NAPIC aims to boost public acceptance of proteins derived from these sources by addressing concerns over taste, nutritional value, cost, safety and fears about diminished livelihoods for traditional farmers. To do so, it will harness world-leading science to create a strategy for alternative proteins which will take them from the discovery and innovation phase, right through to commercialisation.

The project leaders believe NAPIC could catalyse the projected UK growth potential in alternative proteins of £6.8bn annually, with 25,000 jobs created across multiple sectors, as predicted by the Environmental Group Green Alliance in 2023.

The centre will support research and innovation into various forms of alternative protein. It will also bolster the alternative proteins sector in the UK, turn ideas into reality, and strengthen the UK's position as a leader in this rapidly emerging global market.

NAPIC will drive innovations across the entire alternative proteins supply chain, and in various sources of alternative proteins from plants to microbes, and insects to algae.

Animal agriculture is estimated to produce up to a fifth of planet-warming emissions, and with the global population projected to reach nearly 10 billion by 2050, the demand for protein is expected to rise significantly. Some sources, such as the UN Environment Programme, estimate meat consumption alone could grow up to 50 per cent by 2050.

As the global population rises, supplementing traditional agriculture with alternative protein sources is mission-critical if we are to meet increasing demands sustainably. Plant-based proteins, such as soy and peas, and lab-grown meats are excellent alternative sources of protein, supporting products that offer a more sustainable and resilient approach. These products also typically have a lower carbon footprint and can be produced with fewer resources.

Over 30 researchers from the four institutions and more than 120 NAPIC partners will work closely with industry, regulators, investors, and policymakers to create a vibrant alternative protein innovation ecosystem and produce a clear roadmap for the development of a National Protein Strategy in the UK.

Together they will work on four interdisciplinary knowledge pillars to efficiently and safely translate new technologies which could unlock the benefits of alternative proteins:

- The 'Process' pillar, led by Professor Polizzi, will act as a catalyst for the mainstreaming of cultivated meat and precision fermentation to diversify and accelerate the use of alternative proteins.
- The 'Perform' pillar, led by University of Leeds, will ensure that alternative proteins perform well in terms of taste, texture, and public health, both before and after consumption.
- The 'Produce' pillar, led by the James Hutton Institute, will develop tasty, nutritious, safe, and affordable alternative protein foods and animal feeds necessary to safeguard present and future generations, while addressing concerns about ultra-processed foods and assisting a fair and managed transition for people in the agricultural sector.
- The 'People' pillar, led by University of Sheffield, aims to deliver a fair and managed transition to an alternative protein-rich future and will inform consumers' dietary transition. This will focus on affordability and acceptability, highlighting benefits for health, identifying new business opportunities for farmers and future-proofing the UK's protein supply against reliance on imports.

NAPIC also aims to develop the future leaders of what is a rapidly evolving sector experiencing significant consumer demand. It will offer bespoke technical, entrepreneurial, regulatory and policy training, and promote the exchange of knowledge through an unrivalled international network of partners, including the United Nations.

Professor Sarkar said: "Our ambition is to deliver a world-leading innovation and knowledge centre which will put the UK at the forefront of the battle for population health equity and the fight against climate change."

https://dub.sh/IE41-Tasty

Photo courtesy of Imperial College London

Professor Karen Polizzi (Imperial College London) Professor Derek Stewart (James Hutton Institute) Professor Anwesha Sarkar (University of Leeds) Professor Louise Dye (University of Sheffield)

If a Tree Falls in a Forest and No One is Around to Hear It, Does the Global Carbon Stock Change?

Some decades ago, when general awareness of the fragility of our planet was becoming mainstream, the RSMA created the RSMA Essay Competition. In 2019 the Illing Family made a significant donation to the RSMA and the RSMA Committee chose to recognise this by renaming the Essay Competition to the RSMA Illing Essay Competition. The Competition is for all Engineering students, UG and PG to submit a short essay of maximum 2000 words linking their programme of study at the Royal School of Mines/City and Guilds Departments to the environment and sustainability. The 2024 winner is **Georgia Ray** (MSc Environmental Data Science and Machine Learning). This is her essay.

Accounting carbon stock is a wide-ranging and ever-changing challenge, evincing continued human ignorance of the natural world even amid the data revolution. The Department of Earth Science and Engineering at Imperial College London launched a Masters program three years ago called Environmental Data Science and Machine Learning, identifying these knowledge gaps and equipping students with the necessary skillsets to find the answers.

How many trees are there in the world?

A simple enough question, answers dealing in approximations challenge the certainty of a modern, Internet-based knowledge ecosystem purporting omniscience. The most recent global tree count occurred in 2015, using (then) state-of-the-art satellite imaging methods alongside more traditional ground measurements to calculate a worldwide population of 3.04 trillion trees, an estimate an order of magnitude higher than previous estimates (Crowther et al., 2015). A step forward in accuracy, this study and the technology it employs are almost a decade old, ancient in terms of scientific accuracy, and particularly so for a fluctuating measurement. In fact, between 2010 and 2020, approximately 4.7 million ha of forest land was lost per year, equating to a loss over the 10-year-period roughly equivalent to the whole of Kenya (FAO, 2020).

This loss, driven by deforestation, wildfires, and extreme weather, makes accurate accounting of the global tree stock more important than ever. Trees are an indicator of biodiversity, crucial for maintaining ecosystems, and contribute to climate regulation by sequestering carbon dioxide. Over 70% of the global, vegetation-based carbon storage can be attributed to forests (IPCC, 2022).

Coinciding with the death of forests has been the birth of a new sector: the voluntary carbon offset market. This market has commodified trees' carbon stocks, which were historically considered a negative externality. Affecting society via contribution to the climate crisis and loss of biodiversity, until recently impacts from deforestation or carbon emissions (or both) were not factored into industrial economic calculations. They were considered externalities – unaccounted-for side effects borne by society rather than the businesses causing them. But externalities can be internalized via consumer and stakeholder demand, and as the climate crisis rages, more companies are being called to corporate social responsibility in offsetting their carbon emissions. In 1999, 35% of the world's 250 largest companies had Environmental, Social and Governance (ESG) initiatives. By 2020, that percentage had increased to 96% (KPMG, 2020). There has been a veritable boon in voluntarily protecting forest carbon, often a corporate backdoor in place of reducing their own emissions, and also very often a corporate side door deployed as part of a broader net zero strategy including both internal emission reduction and carbon offsetting.

So, how many trees are there in the world? And if a tree falls in a forest and no one is around to hear it, does the company that vowed to protect that forested area as part of their carbon offsetting need to plant a new one?

Without accurate metrics on the number of trees in the world, it is impossible to have accurate metrics on the global carbon stock. Even on a smaller scale, specific areas often lack a clear understanding of the number of trees and their carbon sequestration potential. Studies have shown a stark overestimation in the amount of carbon storage approximated for forests. In one study, focused on California, manual forest carbon stock practices systematically overestimated the amount of storage up to a value of $410 million (Badgley et al., 2022). And in the context of the carbon offset market, monetary overestimation is directly correlated with emission reduction overestimation. Carbon offsetting is predicated on the assumption that emissions produced will be matched by emissions reduced. Inaccurate estimates in the latter undercut the viability of an industry already criticized for greenwashing, a term suggesting environmental pledges from companies are token gestures, rather than actionable change. But the voluntary carbon market, if well-verified and accurate, fills a regulatory gap in bolstering global carbon stock, allowing companies a solution in the face of market pressures calling for environmental goodwill.

Forest carbon is far from the only carbon offsetting mechanism, but it is central. Many carbon credits are based on preventative deforestation. Calculating the value of a credit is an involved mathematical procedure, but, for many preventative deforestation projects, the minimum baseline is the regional average carbon stock density for the forest type. Reminiscent of the aforementioned tree count approximations, "average" and "regional" are harbingers of imprecise estimations unbecoming of the data-driven world in which we live.

Each individual tree species has a different carbon sequestration potential and each individual tree within an individual tree species has a different realized carbon sequestration benefit. For example, in the Amazon rainforest, the most common tree is *Euterpe precatoria*, a palm tree. Palm trees, with their leafy canopies and slim trunks, are among the least effective species for carbon storage. On the other hand, the second most common tree in the Amazon, the Brazil nut tree (or *Bertholletia excelsa*) is a dense and tall stock, able to reach heights of 50 meters, and therefore sequestering much carbon. When calculating the "regional average carbon stock density," it is clear how using an area where the Brazil nut tree is prominent, and therefore making calculations based on that species, could overcount the contributions of the palms in the region.

Data is increasing exponentially, and earth observation data is no exception. Planet Labs, for example, operates over 200 satellites and captures high-resolution images of the entire Earth's landmass every day (Planet, 2024). The data is available, the question is how it can be leveraged to better understand current tree stocks and their carbon sequestration abilities. Luckily, Artificial Intelligence (AI) has proved a powerful tool for understanding our ever-expanding pool of data.

AI revolutionizes data processing and interpretation through advanced algorithms capable of mimicking human cognitive functions. Using AI allows for the processing and interpretation of large datasets with a level of accuracy and efficiency previously unattainable. Famously deployed for bioengineering tasks like understanding protein folds (AlphaFold) and for engineering tasks such as optimizing aerodynamic designs, there has been a more recent movement to apply AI capabilities to environmental

Background photo of Euterpe Precatoria courtesy of Dick Culbert

challenges. Central to this initiative is machine learning, a branch of AI where algorithms learn from vast datasets rather than relying solely on programmed instructions. This learning process involves feeding the AI system with extensive data, which can be structured (like numerical data) or unstructured (such as images or text). During training, the algorithm identifies patterns and relationships within the data.

AI programmers create algorithmic architectures that can effectively learn. To begin, a Lockean blank-slate is established, uncomplicated in determining its blank-slated nature as compared to humans, the machine knows nothing but randomness and noise. On the first pass through the network, the programmer provides the machine with some data. For illustrative purposes, consider the example of RGB aerial images of forests. Instructed as to the shape of the data (RGB aerial images of forests) and the shape of the desired output (coordinates of individual tree crowns), AI makes a prediction. On the first epoch,[1] this guess is a good-old-fashioned shot in the dark. Once the guess is made, it can be compared to a ground truth, for example, field measurements of tree canopy locations.[2] A mathematical loss is determined, telling the algorithm how correct or incorrect its initial guess was. Through a method termed backpropagation, this loss is then sent back through the architecture where, at every node, gradient descent is calculated. Gradient descent is an algorithm that can numerically estimate where a function is at its lowest value. In order to make the resultant loss as small as possible, each node learns from the calculation of gradient descent based on the initial loss metric, adjusting its weights as biases to move in the direction of loss minimization. Another epoch begins, the data is sent through another time, and backpropagation restarts, iteratively stepping towards the minimization of the loss function and thus a learned representation of the data based on the starting form and desired output. The machine has effectively taken an aerial image of a forest and learned the multi-dimensional algorithm needed to effectively predict the location of individual trees in that image, based on underlying patterns in the data.

Once the model is trained, it can be applied to predict other images of the same kind. One popular model in the field of tree crown delineation is DeepForest, an algorithm trained on RGB aerial images in the National Ecological Observatory Network (Weinstein et al., 2020). DeepForest can be directly applied to aerial images from forests around the world, accurately delineating individual tree crowns with a recall of 72%.[3] Models can also be fine-tuned for specific applications. DeepForest is a generalized tree delineation algorithm, but if a researcher wanted to apply it to a specific agroforestry site in the tropics, they could train it on a few images and for a few epochs, specific to those kinds of trees or that type of site. This process helps the model adapt to the unique characteristics, environmental conditions, and variability present in that particular location, thereby improving its accuracy and performance for the specific application without entailing the computational effort and energy consumption required to train a model from scratch.

Remembering the challenge explained earlier in this essay, it is clear to see how much quicker tree counting can become if it can be done in a matter of seconds by an algorithm. Even if refinement is needed by a human, this process can help elucidate the patterns hidden within forest data and their implications for accounting carbon stock. The example explained above focused on individual tree crown delineation, but computer vision algorithms can also perform classification tasks like assigning a species classification to each identified tree. Taken together, and used with scientifically derived allometric equations from the dendrology community, this innovation has the potential to provide individual, tree-level approximations of carbon storage. An approximation, still, but one with an error relative to the magnitude of an individual tree, rather than a "regional average".

Predicting the movement of a tropical cyclone, estimating the energy efficiency of a building, optimizing agricultural practices to enhance crop resilience to climate change, analyzing ocean currents to predict sea level rise, and developing models for renewable energy generation and distribution networks are all examples of climate-oriented AI, and all the types of projects students and faculty are tackling in the Department of Earth Science and Engineering. AI is energy intensive, and its investment has increased the carbon footprint of corporations and academic institutions alike. However, if it can be used to help solve problems related to the climate crisis, it will take its place as one of many environmental solutions with its own emissions considerations. We cannot let the perfect be the enemy of the good; AI has arrived on the world stage and it is our job to use it wisely. Directing it towards climate solutions could resonate like the impact of a falling tree in a vast, no-longer-unobserved forest.

Resources

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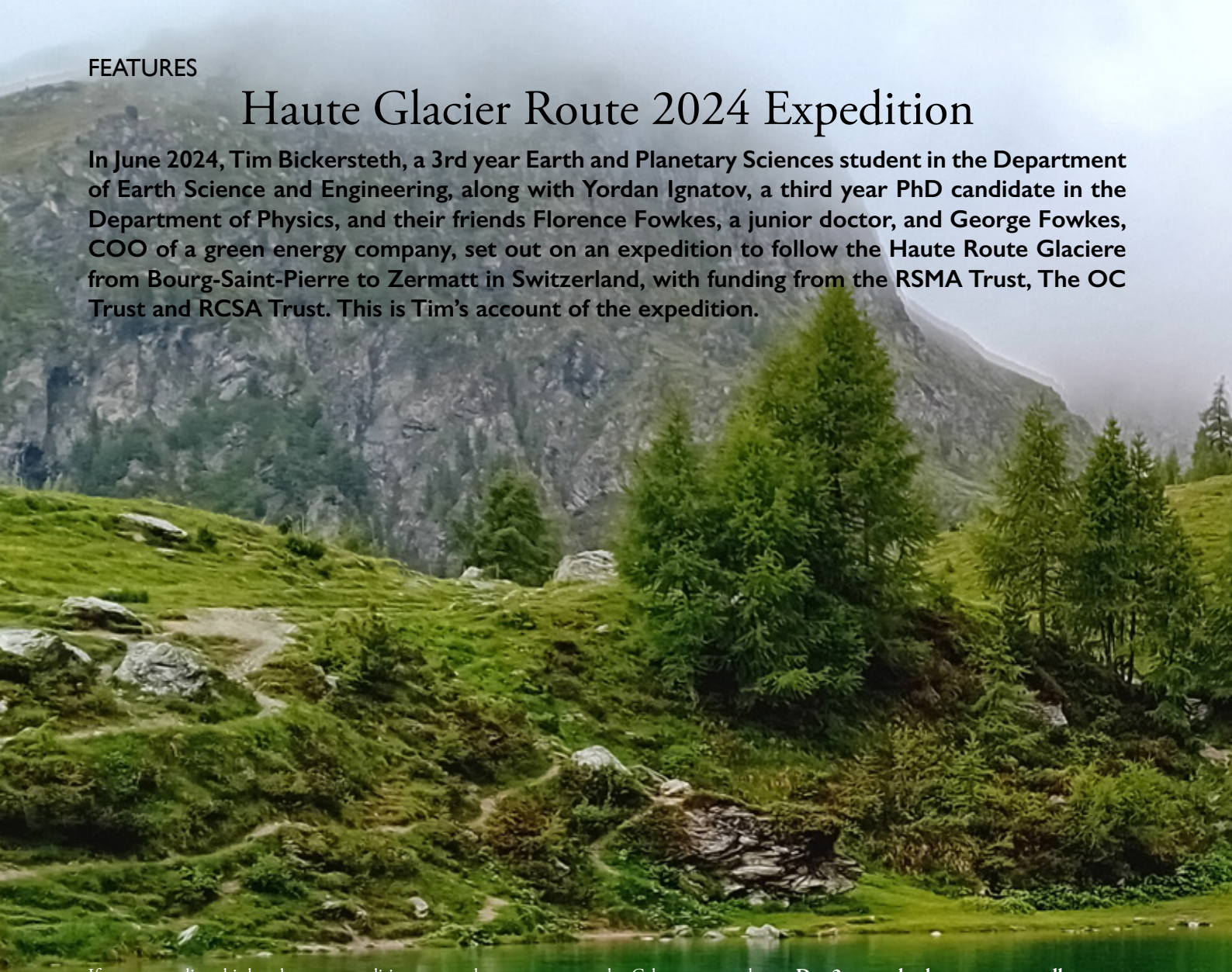
Background photo of Bertholletia Excelsa courtesy of Juan Carlos Torrico/Pixabay

1 Jargon in computer science for one pass of the complete dataset through the system.
2 The description of AI in this paragraph refers specifically to supervised learning, for simplicity.
3 Recall is a metric of true positives; out of all the true tree crowns present in the images (based on ground truth data), the percentage the model correctly identified and labeled.

Georgia Ray completed her MSc in Environmental Data Science and Machine Learning in September 2024. She will be continuing her education with Imperial through the Grantham Institute for Climate Change and the Environment, pursuing a PhD focused on using machine learning to generate sector-specific decarbonisation metrics. Originally from Colorado, USA, she holds a B.A. in Computational Cognitive Science, Philosophy of Science, and Urban Studies from the University of Pennsylvania. She also spent two years researching environmental policy at the Environmental Law Institute in Washington, D.C. specializing in land-based aquaculture regulation, the environmental justice implications of green technology, and legal frameworks for artisanal and small-scale mining. Her interests include carbon accounting, corporate sustainability, and the environmentally conscious application of artificial intelligence.

Haute Glacier Route 2024 Expedition

In June 2024, Tim Bickersteth, a 3rd year Earth and Planetary Sciences student in the Department of Earth Science and Engineering, along with Yordan Ignatov, a third year PhD candidate in the Department of Physics, and their friends Florence Fowkes, a junior doctor, and George Fowkes, COO of a green energy company, set out on an expedition to follow the Haute Route Glaciere from Bourg-Saint-Pierre to Zermatt in Switzerland, with funding from the RSMA Trust, The OC Trust and RCSA Trust. This is Tim's account of the expedition.



If anyone reading this has done an expedition, they will understand that they are adventures but are also learning curves. Here we introduce ours, an alpine trip that didn't quite go as planned…

Having decided on completing the technical glacier Haute Route the team arrived in sleepy Bourg St. Pierre, amongst the cows and the drizzle, from different locations in Europe. We had a day before setting off to go over our kit, food and glacier skills. With one last supper in our bellies, we went to sleep within snoring distance of each other, ready for our first big day in the mountains.

The next morning, the Swiss valleys welcomed us into their arms with huge vistas of the Alps. Setting off from our hostel we were in high spirits, one may say dangerously high. Following an unusually snowy winter and heavy rains during the week prior, we found that our original route up the valley to the Cabane de Valsorey was impassable. The rivers were burgeoning with meltwater, bursting their banks in many places, rendering many river crossings impossible.

Meeting one such river crossing, we decided to turn back and make our way up an alternate route to the Cabane – one that followed a ridgeline much higher up on the mountain. After having spent a few hours ascending (and getting pretty wet), we finally met the ridge and continued onwards towards the Cabane. At this point the wind was getting stronger and the weather was getting worse. To make matters worse, the Alps had had a large late winter snow fall so we reached the snow line much earlier than expected. This slowed us down even further.

Reaching our first snow field, we started across it with our crampons on. This may not have been a wise decision with the weather coming down. However, our destination for the night – the Cabane – was just around the corner. As we traversed the steep snow field one of our team slipped and dislocated their shoulder. This led to an exciting but also terrifying mountain rescue experience and was certainly not desired and cut our expedition short from day 1. A massive thank you must be said to Yordan and Flo for dealing with this situation so efficiently.

Day 2 onwards: the gang gets smaller...

However, this did not cut the trip short. After checking that the injured team member was okay – he flew back the following day – the rest of us decided what to do next. That afternoon we travelled to the next valley which was somewhat lower and had more easily accessible paths. Spending 4 days doing challenging alpine hiking and returning to the valley for the evening increased our confidence and allowed us to spend more time on less steep snowy terrain. These days were fantastic with incredible views when it wasn't foggy. Walking past and swimming in blue glacial lakes as well as seeing eagle-eye views of the valleys were highlights. For the final night, we decided to spend it in one of the famous Cabanes in the Alps which provided fantastic accommodation and the best views.

This required using snow skills that we were now much more confident in. After crossing one valley we were greeted by spectacular views of a glacier and the landscape it had carved. Signs of its retreat were only too visible and reminded us of the perilous times we find ourselves in.

Architecture only the Swiss could achieve welcomed us to the cabane which certainly did not disappoint with huge windowpanes overlooking the glacier. With some good food and Swiss monopoly to keep us entertained it was well worth it.

After saying goodbyes at the Cabane, Tim returned to Geneva to head back, whereas Yordan and Flo's adventures continued...

Flo practising her crevasse rescue skills on George

Setting off on day 1

Photos courtesy of Tim Bickersteth

We are extremely grateful to the people who made this trip possible, including the Imperial Exploration Board, The Old Centralians Trust , the Royal School of Mines Association and the Royal College of Sciences Trust for providing funding. We hope that this article inspires other potential expeditions as memories made and lessons learnt on this trip will certainly last a lifetime.

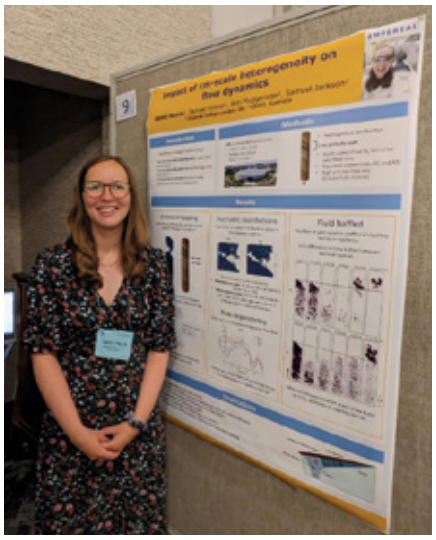
Gordon Research Seminar on Flow and Transport in Permeable Media (GRS)

The *Flow and Transport in Permeable Media* GRS provides a unique forum for young doctoral and post-doctoral researchers to present their work, discuss new methods, cutting edge ideas, and pre-published data, as well as to build collaborative relationships with their peers. Experienced mentors and trainee moderators facilitate active participation in scientific discussion to allow all attendees to be engaged participants rather than spectators. The GRS was held in conjunction with the *Flow and Transport in Permeable Media* Gordon Research Conference (GRC). Catrin Harris, a PhD candidate in ESE, co-hosted the 2024 GRS with financial support from the RSMA.

Recently I attended the GRS on Flow and Transport in Permeable Media from July 13-14, 2024 at the Grand Summit Hotel at Sunday River in Maine. The GRS is a conference aimed at PhD and postdocs, providing a great way for early career researchers to share their research. As the co-chair for the conference, I was responsible for developing the scientific programme. The theme for this year's conference was Flow and Transport Processes to Tackle Climate Change. We invited speakers from many different institutions to talk about a wide range of topics. The talks spanned the diverse role of porous media in climate change – from changes in ice patterns due to climate change to porous solutions such as geological carbon storage and hydrogen storage in the subsurface. It was really interesting to see porous media physics, and laboratory techniques, being applied over such a wide range of applications.

I am a PhD candidate within the Earth Science and Engineering department at Imperial College London. My research focuses on the impact of heterogeneity on capillary trapping during geological carbon storage. I am keen to ensure we can effectively model geological carbon storage, so it is a safe and effective climate change mitigation technology. To this aim, I carried out a set of experiments at the Australian synchrotron to image how flow is impacted by heterogeneity at the cm-scale. These novel experiments allow us to image how the fluids migrate and trap at the pore-scale, in real time. The experiments form part of my wider PhD project which investigates the impact of heterogeneity on geological carbon storage through experiments, numerical simulation and analytical models.

Myself and co-chair Anne Imig, a post-doc at SUSTech, outside the conference venue.



Photos: Catrin Harris

I present my poster on the 'Impact of cm-scale heterogeneity on flow dynamics' at the conference.

At the GRS I delivered a poster presentation detailing my experimental results from the Australian synchrotron. The poster presentation covered the novel imaging set up, as well as detailing how heterogeneous samples differ from current literature comparisons. There was lots of interest from the community, and I had many helpful conversations to develop further research ideas.

The conference venue, Grand Summit Hotel at Sunday River in Maine.

The format of the conference is designed to maximise informal discussion between attendees, with shared meals and additional time dedicated to discussion. This was really helpful to be able to network with world-leading academics and other students. It allowed me to have some great discussions to improve my research. I would like to thank RSMA for supporting my attendance at the conference.

GRS and GRC conference chairs. Left to right: Myself, Masa Prodanovic (The University of Texas at Austin), Marc Hesse (The University of Texas at Austin), Joaquin Jimenez-Martinez (EAWAG, ETH), Anne Imig (SUSTech).

Catrin is completing a PhD within the Earth Science and Engineering department. Their research focuses on fluid flow through porous media, with application to geological carbon storage. Catrin works with Prof Ann Muggeridge and Dr Sam Krevor and is interested in the role of the subsurface in meeting Net Zero targets.

Imperial College Rail and Transport Society Annual Wales Volunteering Trip 2024

Every year, the Imperial College Rail and Transport Society (ICRTS) travels to the town of Penrhyndeudraeth in north Wales, and spends a weekend volunteering on the Ffestiniog & Welsh Highland Railways (Ff&WHR). This is a narrow-gauge heritage steam railway which is maintained entirely by volunteers, and the experience gives society members an opportunity to do amazing hands-on work on the railway, and help keep it running for many years to come. Ryan Voecks, Vice Chair of ICRTS reports on this year's trip.

This year, we departed on Friday 22nd March and returned on Monday 25th March, spending Saturday and Sunday working on the railway. Some of our tasks included clearing debris by station buildings, repainting a water shed, removing old sleepers lying beside the tracks, ballasting a siding and a train shed entrance, and cutting down shrubs in the works yard. Many of the tasks were difficult, but also enjoyable, rewarding and educational.

Friday 22nd March

At 13:00 on the final day of the spring term, we gathered at London Euston station to embark on our annual railway volunteering trip to the Ffestiniog & Welsh Highland Railways (Ff&WHR). After taking a London Northwestern Railway train to Stafford, we changed for an Avanti West Coast service to Bangor. Some members enjoyed spending the journeys playing the London Underground Game (one of our favourite board games), while others frantically finished off some last-minute coursework.

Photo by Jason Dick

Playing the London Underground Game on the train to Stafford

Photo by Edgar Leung

Boarding the Avanti West Coast service to Bangor

After arriving in Bangor around 18:30, we visited a local Chinese takeaway for dinner, then headed to an Asda to pick up our groceries for the weekend. To our surprise, the 'Click & Collect' option was only intended for customers driving cars, so we had to wait in the parking lot for our groceries then pack them into bags. Afterwards we walked to the bus stop, then took a Transport for Wales (TfW) bus to Penrhyndeudraeth. This was our first time taking a bus as part of our journey to Wales, and it was quite comfortable.

Once we arrived, we carried our bags and groceries uphill to the Penrhyn hostel, a converted railway station along the Ff&WHR that we stayed in over the weekend. We arrived at the hostel around 22:30, then packed away our groceries and went straight to bed, tired from the long journey.

Saturday 23rd March

We got up bright and early on Saturday morning to cook a hearty breakfast with bacon, sausages, eggs, mushrooms, toast, cereal, milk and juice, which gave us the energy we needed for the day ahead. After breakfast we made some sandwiches to pack for lunch, then cleaned up and put on our steel-toed boots and high-vis vests and headed outside. The best part of staying in a converted railway station was getting to experience every railway enthusiast's dream: having a train stop outside our front door to pick us up.

Photo by Miles Lewis

The works train arriving at Penrhyn hostel

The works train arrived just after 09:00, formed of a diesel engine, two wagons and a carriage. The railway itself has a gauge of just 1 foot 11.5 inches, allowing the trains to take sharper turns through the hills and valleys along the route. Once onboard the train, we were given a safety induction and briefing for the day by two experienced volunteer leaders. To get started, we took the train to Tan-y-Bwlch, a station about 20 minutes up the line towards Blaneau Ffestiniog. A few of us were lucky enough to take turns driving the train, while others had a chance to operate a level crossing near Penrhyn station. The scenery along the route was truly breathtaking.

Photo by Miles Lewis

Driving the train!

Photo by Miles Lewis

Operating the level crossing near Penrhyn station

Once at Tan-y-Bwlch station, we split into two groups and got to work. One group was tasked with clearing rubble from outside one of the station buildings, which mostly consisted of broken chunks of slate and brick. This involved shovelling the debris into wheelbarrows, then depositing it in a much larger heap further from the station, to be collected at a later point. While this was being done, the other group were scraping rust and dirt from the station's water tower, so that it could be given a fresh coat of paint. The weather was on our side, and the sun peeked between the clouds throughout the day.

As soon as we finished these tasks, we

Photo by Edgar Leung

Clearing debris next to a station building

Photo by Edgar Leung

Cleaning the water tower

climbed the stairs of the station bridge to watch the first passenger train of the season pass through, travelling up the line towards Blaenau Ffestiniog. We then quickly started our next task: clearing old sleepers and rail fasteners lying next to the tracks between Tan-y-Bwlch and Penrhyn. One person also had the task of removing some old cabling from the side of the tracks using a spool. Since this section of the line was single-track, we had to clean up the side of the tracks and get back to Tan-y-Bwlch before the passenger train returned in the other direction.

Photo by Miles Lewis

Clearing rail fasteners from the side of the tracks

Photo by Miles Lewis

Rolling up the cabling by the tracks

The sleepers were very heavy, and took at least three people each to lift, plus an additional two to slide them into place in the train wagon. To make it easier for a forklift to move the sleepers off the wagon once it returned to the rail yard, we were taught to stack them in a 5-wide criss-cross pattern, like Jenga blocks. The track we were working on had just been relaid, so there was an abundance of sleepers to collect. We managed to clear around 25 from the side of the tracks before heading back to Tan-y-Bwlch, where we ate our packed lunches and watched the passenger train pass back through the station.

After lunch, we split into two groups again, to tackle tasks following on from those we had done in the morning. To finish clearing up the area by the station building, one group

Photo by Edgar Leung

Lifting a sleeper up into the wagon

moved several smaller piles of debris and construction waste to a heap further from the station. Meanwhile, the other group started coating the top of the water tower with black paint. We made good progress, clearing all the remaining rubble around the station building, and painting all the area accessible by scaffolding on the water tower.

Shortly after we finished these, the afternoon passenger train arrived at the station. This time we watched as the boiler of the steam locomotive was filled up from the water tower. Once the passenger train had departed, we headed back towards Penrhyn through the now free section of track. Along the way we continued our previous task of collecting sleepers. We managed to pick up a total of around 50 throughout the day. The works train dropped us back off at Penrhyn hostel shortly after 17:00.

Photo by Miles Lewis

The passenger train approaching Tan-y-Bwlch

Photo by Edgar Leung

Watching the train from the bridge

Every year on the evening of the first Saturday of the passenger service season, the Ff&WHR hosts a dinner for the volunteers at Tan-y-Bwlch station. We were lucky enough for this to coincide with our visit and were kindly invited along. At 18:30 we boarded a passenger train drawn by a steam locomotive, which arrived outside the door of our hostel. For each section of the journey to Tan-y-Bwlch, we took turns riding on the footplate of the locomotive. This gave us each the chance

Photo by Edgar Leung

Being picked up by the train for dinner

to watch the driver and boiler man in action, as well as catch an unforgettable glimpse of the blazing coals in the firebox.

While in the passenger carriages we met the conductor, who, we learned, was himself an alumnus of the City and Guilds College Union. He studied Chemical Engineering at Imperial over 50 years ago, and it was great to talk to him about his career experience and interest in the railway.

At Tan-y-Bwlch we were served delicious lasagne and apple crumble, before hearing speeches from the lead volunteers about the past and future of the railway. We then boarded the steam train back to the hostel, and again had the opportunity to ride on the locomotive's footplate. The train arrived at Penrhyn shortly after 21:30, giving us some time to relax before heading to bed.

Photo by Edgar Leung

Volunteer dinner at Tan-y-Bwlch

Sunday 24th March

On Sunday morning, we got up early to cook a delicious breakfast again. Then, after making some sandwiches for a packed lunch and cleaning up, we donned our safety equipment and headed out onto the platform. We were picked up promptly at 09:00 by a volunteer leader driving a single diesel engine. There was just enough room for all of us to squeeze into the cabs at either end and head down the line to Boston Lodge, near Porthmadog, the western terminus.

Boston Lodge is the location of the main depot and sidings for the Ff&WHR. In addition to tracks and sheds for storing locomotives and carriages, the depot has a maintenance and construction building for rolling stock. The volunteers there build and refurbish locomotives and carriages for the Ff&WHR, as well as to sell to other heritage railways.

By the time we arrived it had started to drizzle. Luckily, the rain only lasted briefly, and didn't come back for the rest of the day. Our tasks at the depot mostly involved

Photo by Edgar Leung

Our ride for the day

aiding in the ongoing renovation of the site. To start, we split into two groups to do some preparatory work. One group moved a pile of old sleepers lying in the yard to a new pile by the tracks, so that they could be loaded onto a wagon more easily later on. The other used shovels to dig up the ballast around a drainage pipe, fully exposing it to allow a cover to be placed on top.

Photo by Edgar Leung

By the entrance to Boston Lodge Depot

For our next task, we joined back together to unload scrap wood (from stripped carriages and used palettes) from a wagon into a heap by the edge of the rail yard. After finishing this quite quickly, we loaded some shovels, rakes and wheelbarrows into a separate wagon. We then watched as two experienced volunteers coupled this wagon to another filled with gravel. A diesel engine was used to shunt these to a recently built siding. This particular siding was used for storing carriages overnight, and was walked through by volunteer staff in the dark after evening services. There were no lights in the siding, and our job was to add ballast along the track to improve the evenness of the walkway. This would make the siding safer and easier to use.

Photo by Edgar Leung

Digging gravel around a pipe

Photo by Edgar Leung

Moving sleepers in the rail yard

Ballasting the track required us to each take on one of three roles: shovelling gravel from the wagon into wheelbarrows, moving the gravel to where it was needed using the wheelbarrows, and raking the ballast to spread it evenly after the gravel was deposited. Moving the gravel was hard work, but it was very rewarding to see the entire siding track freshly ballasted once we were done.

Photo by Edgar Leung

Unloading scrap wood from a wagon

At lunchtime, we ate our sandwiches on some benches with a great view of Porthmadog across Tremadog Bay. The morning passenger service also whisked by us while we were eating. Sitting nearby were some of the regular volunteers at the depot, and we enjoyed talking to them about the work they were doing. There were electrical and mechanical engineers repairing train carriages, and a boiler man who shovelled coal for the steam locomotives.

After lunch we laid some more ballast, this time at the end of a different siding, next to a train shed. Working without the aid of a

Photo by Edgar Leung

Ballasting the tracks

Photo by Edgar Leung

Laying gravel in the depot yard

gravel wagon, we had to dig the gravel out of a heap nearby, which was harder. The result of our work was an even layer of gravel all around the end of the siding, which extended to an entrance of the train shed, making moving parts and equipment in and out much easier.

Our final task of the weekend was to clear some shrubs on the outskirts of the depot, to make room for storage areas or future buildings. Using a couple pairs of shears and a saw, we worked together to tackle the biggest clump of shrubs, which was a few metres wide and tall. Although we didn't have time to clear all of them, we made good progress, and cut off enough branches to fill half a train wagon.

Photo by Edgar Leung

Cutting down shrubs

After we had finished our tasks for the day, the lead volunteer gave us an amazing tour of the depot. The first stop on the tour was the erecting shop, which is the main area for the construction and assembly of locomotives. There were locomotives in many different degrees of disassembly, from a lone boiler to a near-complete engine. We then walked through several rooms dedicated to different stages of carriage construction, including chassis building, woodwork, electrical work and finishing. Along the way, we got to meet several regular volunteers and hear about the exciting projects they were working on.

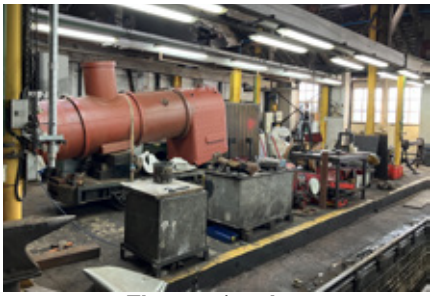


Photo by Edgar Leung

The erecting shop

Our return journey to the Penrhyn hostel was in the same diesel locomotive as earlier in the day. However, instead of heading straight back, the volunteer driving the train kindly took us out onto the embankment which connected the track at Boston Lodge to Porthmadog. This gave us a beautiful view of Tremadog bay and the river Glaslyn which flows into it. On the way back several families stopped to wave at the train as we went by, which was a great reminder of the appreciation of the community for the work of the Ff&WHR volunteers.

Once back at the hostel, we started cooking dinner: spaghetti bolognese (albeit with penne). This turned out well, and was enjoyed by everyone. After eating, we played the Great Western Railway Game, a classic 1985 board game kept at the hostel (which has been played yearly by Imperial College Rail and Transport volunteers for as long as we can remember). After a close finish, we went to bed, exhausted from the weekend's work.

Photo by Edgar Leung

The Great Western Railway Game

Monday 25th March

Like the previous two days, we started our day by cooking a delicious breakfast early in the morning, then making sandwiches for our packed lunch. We spent much more time cleaning up afterwards, making sure that the kitchen was spotless, then packed our bags and tidied the rest of the hostel. Just as we finished vacuuming everything, the next occupant at the hostel arrived. We made sure that it was in a perfect state for him and any other future guests.

Our route back to London was very similar to our outbound journey. We carried our bags down the hill into the town centre of Penrhyndeudraeth, and caught a TfW bus to Bangor. This time our journey was during the daytime, so we got to appreciate the great views of the Welsh countryside. Once in Bangor, we walked to the train station, but boarded a TfW train bound for Holyhead rather than London. This was so we could visit the next station on the line: Llanfairpwllgwyngyllgogerychwyrnd-robwllllantysiliogogogoch! Bearing the longest name of any train station in the world, it's an absolute must-see for railway enthusiasts. After taking some fun photos, we boarded a TfW service back to Bangor, where we ate our packed lunches.

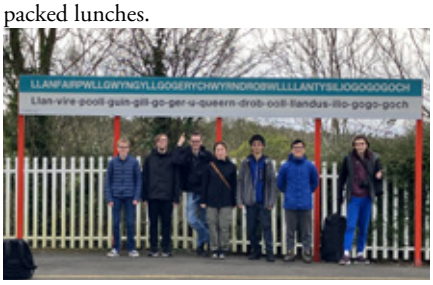


Photo by Edgar Leung

After we finished eating, our Avanti West Coast service to Stafford arrived. We spent this journey playing the London Underground Game, but were all tired out on the final train, from Stafford to London. Once we arrived at Euston, we said goodbye, but not before remarking about how great the trip was and how much we're looking forward to next year's.

Acknowledgements

I would like to offer my heartfelt thanks to the Old Centralians' Trust on behalf of Rail and Transport Society for your generous contribution towards our annual volunteering trip to Wales.

I would also like to offer special thanks to John Sharp and Professor Tim Green for their continued support of the society and referring us for the grant, as well as to Alex Spring and Iain Wilkinson from the Ff&WHR, who organized our tasks for the weekend and taught us so much about the railway.

Comments from participants

"This is my second time coming on the Wales Volunteering Trip, and this time was just as magical to me as the first time. No matter how many times you come here, each experience will be completely unique. My greatest memories from my first year at Imperial came from this trip, and so far it seems that this will be the case for my second year. For me, this trip provides a very welcome contrast to the academic atmosphere of Imperial. All of the work we're given in Imperial is simulated, so I never feel like I'm making a difference when doing it. On the railway it's different. Each sleeper you move, each wheelbarrow you tip, and each wall you paint physically shapes the world around you, so you actually feel like you're doing something beneficial. After an entire term of simulated intellectual work, going to the railway and performing work which actually makes a difference is exactly what I needed to emotionally recover."

"We participated in various volunteering tasks on the Wales trip this year. Although I am physically weaker, I still tried my best to help! I liked the ballast laying part the most, seeing the gaps in the tracks gradually fill up with small rock pieces was very satisfying! I am also impressed by the experience of other volunteers, especially the driver and fireman of the steam train at night during my footplate experience, they have no interior light fitted in the cab, but they can still drive the complex steam train safely at the full 20mph, remembering every curve and bend along the way, all with just some dim headlights and a hand held torch! The whole trip was great fun and a truly unique experience, and I would like to come back for more next year!"

"We started off with the long journey to the hostel playing some board games on the train. The next day we helped clean up the plaster board from the old station house and painting the water tower. We also helped with moving sleepers on to the train. Then we had a lovely volunteers' dinner, which was nice seeing and chatting with other volunteers on the railway. The next day we helped out at Boston Lodge with clearing foliage and laying gravel. Finally on Monday we had the long journey back. It was my second time on this trip and I thoroughly enjoyed myself and hope the others did too. Can't wait to visit again next year!"

"The 2024 Wales trip with ICRTS was an unforgettable, once-in-a-lifetime experience. We gained hands-on experience maintaining the Ffestiniog & Welsh Highland Railways railway and stayed at a hostel converted from an old train station. In the morning, the train that would take us to the worksite stopped right outside of our hostel, and we got to enjoy the beautiful views of the Welsh countryside all the way to the worksite. One of the highlights was the staff members from the railway, who were incredibly welcoming and keen to show us the trains and share their knowledge with us. Under their guidance, we got to drive a train and ride on the footplate of a steam train."

"Once again, Imperial College Rail and Transport Society's annual volunteering trip to Wales provided me with an unrivalled hands-on experience working on the Ffestiniog Railway. Some of our volunteer activities included clearing up debris around a station, painting a water shed, removing old sleepers from the side of the tracks, laying ballast in a siding, and doing some gardening near the depot. All this work had a visible impact and was educational about the maintenance needs of an operational railway. I also enjoyed riding in the cab of both a diesel and steam engine while we were there. Another great aspect of the trip was getting to know the other participants, during our journeys, at the hostel, and while working. Additionally, it was fascinating to meet the experienced volunteers on the railway, and learn from their career stories, motivations, and limitless railway knowledge. Overall, the trip was incredibly fun and educational, and I can't wait to go again next year. I would like to thank the City and Guild's College Association for making this amazing experience possible!"

"I had a great amount of fun and working experience for the maintenance of the Ffestiniog and Welsh Highlands Railway. Our team of railsoc members had worked together to paint water sheds, maintaining track beds and removing sleepers, as part of a greater effort to help preserve the centuries-old railway that is the Ff&WHR. It was exciting to be able to work along railway professionals and I have gained further interest in the working of a railway."

86th Annual Meeting of the Meteoritical Society

Mark Boyd, a Planetary Science PhD student in the Department of Earth Science and Engineering, reports on the annual meeting of the Meteoritical Society in Brussels this summer, having been supported by the OC Trust to attend.

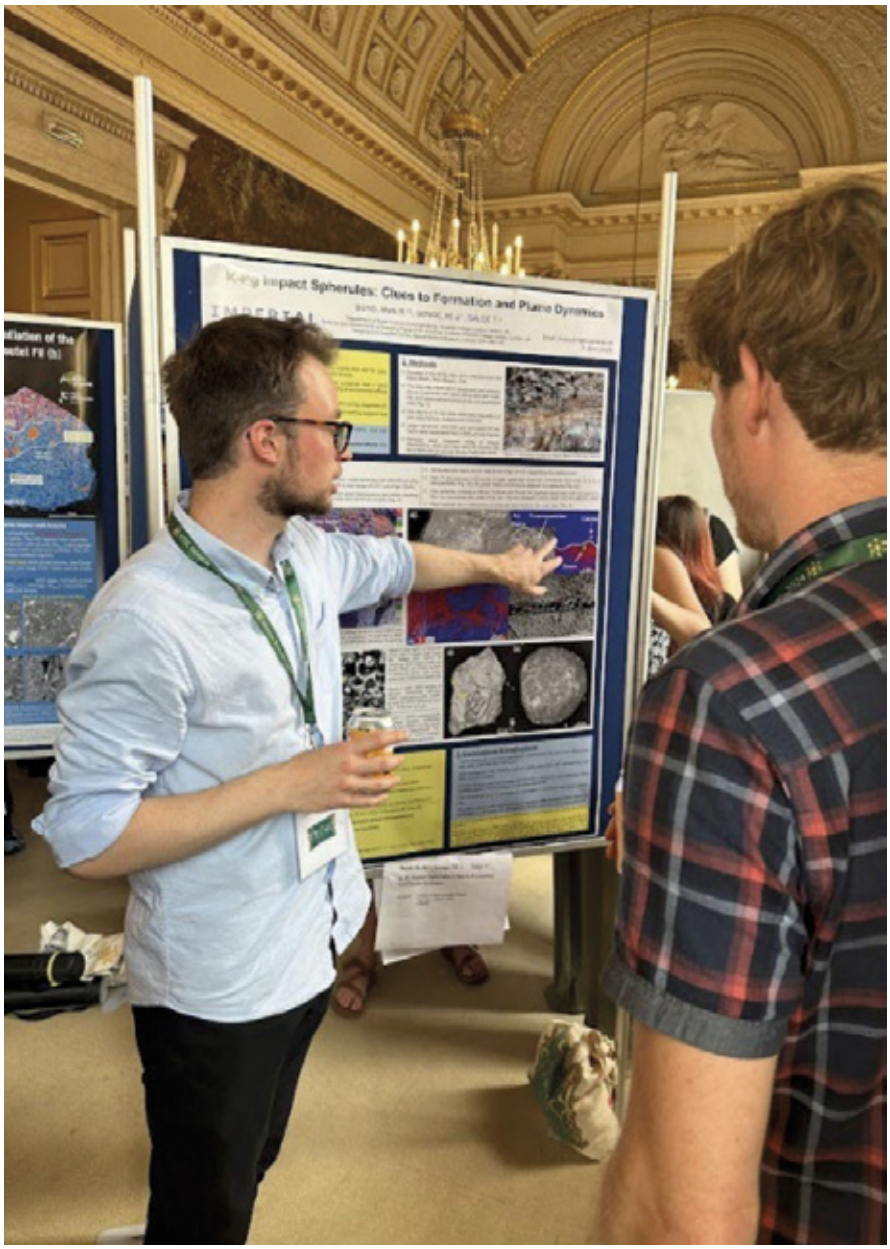
From 28th July to 2nd August 2024, I attended the 86th Annual Meeting of the Meteoritical Society. This is an international meeting of planetary scientists, geologists and meteoriticists from academia, industry, curation and collection, discussing the latest developments in planetary body and astromaterial research. The conference was held at the Academy Palace, Brussels, and spanned three parallel sessions daily, two poster sessions, and a host of networking and social events. I presented my PhD work, *K-Pg Impact Spherules: Clues to Formation and Plume Dynamics*, at the Thursday evening poster session.

The conference was an excellent experience and greatly beneficial for my career and personal development. I attended talks ranging from sample return missions to impacts, cosmic dust to primitive meteorites. Not only did these provide useful updates but helped to place my research in its wider context. For example, the talks on asteroid and meteorite impacts demonstrated materials, alongside spherules, that are used to identify ancient craters, such as deformed quartz grains.

Meeting researchers within my discipline (micrometeorites and cosmic dust) was important to discuss how our community can work together to solve common problems, rather than repeating work. Several authors had found unusual particles in their samples when searching for micrometeorites. My research is driven by identifying 'micrometeor-wrongs' in the geologic record and, as such, seeing analyses of these unknown particles and understanding their geological setting was key.

For the first time, MetSoc 86 piloted a mentor program. I was paired with a postdoc from Brussels, who reached out prior to the meeting with a virtual introduction, and met with me early in the week. My mentor and I are asking similar research questions, so it was an exciting relationship to develop throughout the week. Along with other researchers I had approached, my mentor attended my poster and offered helpful insights (and left me with more questions!). From discussions at my poster, I plan to perform transmission electron microscopy analyses, and have identified labs in Germany and Scotland who are willing to support this work.

As I come towards the end of my PhD, I am considering next steps and actively looking for postdoc opportunities. The conference provided an informal opportunity to hear from academics about their research interests, and possible routes for funding at their respective institutions. I had fruitful discussions with researchers in the UK, Belgium, Italy and Germany, hearing about ongoing projects related to my PhD work. I plan to follow-up on these connections to explore future opportunities.



In addition to the scientific program, my time in Brussels was an exciting opportunity to broaden my cultural horizons. I was able to practise some French, join an excursion to the European Parliament, and visit local heritage sites and museums (including the largest dinosaur gallery in Europe). Social events, including an early career researcher lunch and a mid-week banquet, provided informal opportunities to meet new colleagues and catch-up with old friends from across the world.

The generous support of the OCT was used to fund travel to the conference, public transport in Brussels and meals throughout the week. All meals were within the Imperial College expenses policy limits, and where possible, sustainable travel options were chosen. Thank you to the OCT and board for supporting this enjoyable and professionally beneficial experience.

Frank Morton Sports Day 2024

The Frank Morton Sports Day is an annual sporting competition between students of Chemical Engineering departments from UK and Irish Universities. The event is named after Professor Frank Morton, a noted professor of Chemical Engineering, who taught at Birmingham University and then UMIST, and organised the first of these sports days. It is also a careers event where many students can network with different companies along with students from other universities. The 2024 event was hosted by Swansea University on 19th February. Arrangements for Imperial's participation are organised by Imperial Chemical Engineering Society (ChemEngSoc). The Chemical Engineering Department provided some financial assistance. In the past support has also been provided by Shell. But ChemEngSoc has now transitioned away from the oil and gas industry and therefore does not accept sponsorship from Shell. They sought and were given funding from the OC Trust. They provided this brief report of the day.

Purpose

The purpose of participating in the annual Frank Morton Sports Day extends beyond the thrill of competition; it fosters a unique environment for networking and camaraderie among chemical engineering students from various universities. For Imperial's Chemical Engineering Society, visiting Swansea for this event presented an unparalleled opportunity to build connections with peers from different institutions. These connections are crucial as they pave the way for future collaborations, professional networking, and a deeper understanding of the diverse perspectives within our field. Engaging in friendly competition and social activities also enhances team spirit and strengthens the bonds within our own society, promoting a more cohesive and motivated group of future engineers.

Moreover, the Frank Morton Sports Day serves as an inspiring break from the rigors of academic life, offering a balanced blend of physical activity, teamwork, and fun. This holistic approach to personal and professional development is invaluable, as it encourages students to develop skills such as leadership, communication, and strategic thinking in a dynamic and enjoyable setting. By visiting Swansea for this event, our Chemical Engineering Society members gained a memorable and enriching experience that underscores the importance of balancing academic excellence with personal well-being and social interaction. This trip has undoubtedly contributed to the overall growth and success of our students, both in their studies and in their future careers as engineers.

Logistics

There were 99 participants from Imperial.

05:45 – Registration and T-Shirt Collection
06:15 – Departure from Imperial
10:00 – Arrival at Swansea University
10:30 – Opening Ceremony and Networking
12:00 – Travel to Respective Sports Locations
12:30 – Sports Begin (Wave 2 for Imperial)
16:00 – Sports End and Free Time
19:00 – Evening Entertainment at Sin City
20:00 – Closing Ceremony
20:30 – Student Performances
22:30 – DJ Set
01:00 – Departure from Dragon Hotel
04:30 – Arrival at Imperial

Photos courtesy of Imperial Chemical Engineering Society

There were over 500 participants from 11 universities. The final points table was:

Nottingham	20
Birmingham	13
MTU	10
Imperial	9
Swansea	8
UCD	4
Surrey	2
UWS	2
Manchester	1
Bradford	0
UCL	0

Vaccine storage innovators win Imperial's women-led startup competition

A student team developing technology to reduce the number of vaccines lost to spoilage has won Imperial's competition for new women-led startups.

Sealeo, led by Innovation Design Engineering students **Diana Epel** and **Emanuele Griccioli**, has been awarded the top prize of £15,000 in Imperial's WE Innovate Final.

The team is aiming to reduce the high levels of drug and vaccine spoilage in supply chains, particularly in remote areas where there is less access to cold storage infrastructure. They are developing a novel, biodegradable packaging solution which they say can maintain a safe temperature range for life-saving medicine for up to 2.6 times longer than existing products.

The World Health Organisation estimates that up to 50 per cent of vaccines are wasted globally, often due to issues around maintaining the temperature-controlled supply chain every step of the way. Sealeo believe their cost-effective packaging technology could transform life-saving drug and vaccine delivery in under-served areas.

Diana Epel, co-founder and CEO of Sealeo, said: "WE Innovate has been a truly transformative journey for us! Since day one, it felt like a safe space where you are not being judged but supported and nurtured instead.

"The programme helped us turn an idea that began as our master's project into a startup set to make a real impact in the world. Through invaluable conversations with our business coach, clearly structured workshops, and the support of the WE Innovate community, we've grown so much as a team and as a business. We often joke that we have earned a business degree on the side. It is such a rewarding and humbling feeling to see all the hard work pay off."

She added: "The prize money will enable us to protect our technology through patents, moving us closer to manufacturing and pilot tests. We are immensely grateful to everyone involved in the programme for their support over the past six months and look forward to continuing this incredible journey."

This year's finalists pitched to an expert panel. The final also saw a keynote speech by Shadow Secretary of State for Women and Equalities Anneliese Dodds on the value of women-led businesses to the UK economy.

Speaking at the event, Professor Mary Ryan, Imperial's Vice Provost for Research and Enterprise, said: "This year is a very special year as we mark 10 years of WE Innovate. We have seen the programme grow from quite humble beginnings to the programme we have today which I think we can safely say is a world-leading programme for women innovators and entrepreneurs.

"In 2018, 1 per cent of all venture capital funding went to women teams. It has got a little bit better, but in 2024, it is still below 5 per cent – so there is a lot of work for all of us to do. WE Innovate is part of that work and Imperial is committed to continuing this support."

She added: "We know that when teams have diversity of thought, you get more creativity and better outcomes, you get more scalable and more accepted solutions. As an organisation that cares about impact, it is natural that we also care about diversity of thought. We know that both opportunities and barriers are not spread equally – it is our job to try to fix that."

Other awards went to:

- *Sensyre*, founded by Innovation Design Engineering student Sade Heino and Global Innovation Design student Samantha Clarke, was awarded second prize of £7,000 for its technological medical intervention to tackle treatment and recovery after injury for athletes.
- The third prize of £5,000 was awarded to *Pera*, founded by Innovation Design Engineering students Maria Asif, Hanju Seo, Alexander Spencer and Sven Winkler von Stiernhielm. The team is developing a wearable device that could help make life easier for people with bowel incontinence by predicting bowel movements.
- Further runners up, each awarded £1,500, were *Hi-Fond*, led by Management student Alvia Shadqah, and *BIA*, led by Global Innovation Design student Vedika Lall.
- *Arcus* received the Lauren Dennis Award – given in memory of a pioneering WE Innovate alumnus. The prize is awarded to the team demonstrating an exceptional entrepreneurial spirit in STEM. The recipient will receive a six-month business coaching package.
- *Transpexa* and *Qualboat* received the Engineers in Business Award, which offers £1,500 in grant funding for each winner, mentorship and a professional CV package for entrepreneurs spanning engineering sciences. The award is sponsored by the Engineers in Business Fellowship.

The WE Innovate programme, run by Imperial Enterprise Lab, is a targeted pre-accelerator which aims to support the next generation of women entrepreneurs and help them develop new businesses.

Women entrepreneurs often face barriers when growing their businesses, such as limited access to finance, networks and business support. For example, women-led businesses received less than 2% of venture capital funding in the UK in 2023.

Now in its tenth year, WE Innovate has supported more than 60 women-led startups with help to grow their businesses, including coaching, mentoring, and business skills masterclasses. Teams from the programme have gone on to raise more than £37.5 million in external funding.

After a successful first decade, WE Innovate is now opening its doors to new sponsors to develop plans to expand the programme to all corners of the UK and create a national WE Innovate network.

It is hoped that WE Innovate can have even more impact in supporting women-led startups by expanding beyond London to a further six regions across the UK.

https://dub.sh/IE41-Sealeo

Photos courtesy of Imperial College London

Professor Mary Ryan presents Diana Epel and Emanuele Griccioli with the top prize

Young Engineer award

Dr Ruben Doyle, who completed his Imperial PhD in Mechanical Engineering in 2019 and is now CEO at Additive Instruments Ltd has received a Young Engineer of the Year award from the Royal Academy of Engineering

He created a device to make surgery such as hip replacement safer. Surgical implants are hammered into place by the surgeon, creating friction that holds the implant in place. If the surgeon hammers the implant too rigorously with a manual mallet, the bone may be over-stressed and fracture. Ruben's smart device makes hip replacements safer by sensing the force being applied to the instrument and adjusting it to reduce the chances of fracture.

After patenting his invention, Ruben founded Additive Instruments Ltd and became its CEO to bring the device to market – winning a Royal Academy of Engineering Enterprise Fellowship to kick-start the venture. Additive has won funding from many bodies including an NIHR Product Development Award, Innovate UK Smart Grant and Sustainable Innovation Award. During Covid, Additive won funding from the Royal Academy of Engineering and Innovate UK to develop 3D printed face masks.

Dr Doyle reacted to the award, saying: "I couldn't be happier to be recognised for my work with Additive Instruments – I can't overstate how great I think the support of Royal Academy of Engineering, and particularly the Enterprise Hub, is. Every single engineer that I know who has been through the Enterprise Fellowship raves about it – it's a launchpad that I'd argue has led me to this very award."

Luke Logan FREng, Chair of the Academy's Awards Committee, said: "I congratulate the worthy winners of this year's Young Engineers of the Year. Their groundbreaking innovations demonstrate the vital role engineers play in addressing some of society's most pressing challenges."

https://dub.sh/IE41-RAEng-Prizes

IDE alumna honoured with Innovate UK Purple Plaque

Beren Kayali, an Innovation Design Engineering alumna, received a Purple Plaque from Innovate UK for winning the Women in Innovation award.

The plaque was installed in front of the Dyson School of Design Engineering Building's boardroom UK on 1 August 2024, providing a lasting tribute to her achievements. This accolade recognises Beren's role in co-founding Deploy Tech with Paul Meindieta, a startup dedicated to transforming water management.

Beren's journey in STEM began in high school when she got involved in a robotics club. "I noticed I am quite hands-on; I love solving problems with practical skills using STEM," Beren recalls. She pursued a mechanical engineering degree in Turkiye and completed numerous internships to explore different career paths. Her passion for combining engineering with design led her to apply for the Innovation Design Engineering (MA/MSc) programme at Dyson School of Design Engineering. "I felt like it was a programme created specifically for me, combining engineering and design, science and art," she says. During her final semester, COVID-19 hit, and Beren took a leave of absence. During this time, she began helping Paul, the co-founder of Deploy Tech, with the project that would become their startup. By the time she graduated, they had a solid plan to make Deploy Tech a reality.

Throughout her journey at Imperial, Beren has benefitted from the support of Imperial's Enterprise Lab, which offers vital resources and mentoring to help students and alumni develop their entrepreneurial ventures. Her participation in Imperial's climate innovation accelerator programme, The Greenhouse, run by Undaunted, further highlights her dedication to addressing environmental challenges through innovative solutions. Beren has also been recognised with accolades such as being named in the "30 Under 30" list and receiving the Venture Catalyst Challenge Social Impact Prize.

Photo courtesy of Imperial College London

Mary Ryan (Vice-Provost (Research and Enterprise)), Beren Kayali (Co-founder, Deploy Tech), Robert Shorten (Head of Department, Dyson School of Design Engineering)

The Purple Plaque celebrates her innovative efforts and aims to inspire women to pursue careers in STEM fields.

The UK is home to thousands of blue plaques, with 900 in London alone, honouring pioneering historic figures. Yet, fewer than one in seven of these blue plaques feature women, revealing a significant lack of female role models across media, business, and education.

In response to this disparity, Innovate UK launched the Purple Plaques campaign in 2019. This initiative aims to recognise the achievements of Women in Innovation Award winners. These awards include a £50,000 cash prize and bespoke mentoring to help winners scale up and bring their pioneering business ideas to market.

Beren Kayali's recent recognition with a Purple Plaque underscores the campaign's mission. As a recipient of the Women in Innovation Award, Beren exemplifies the kind of innovative spirit and leadership that the initiative seeks to highlight and promote. The plaque, now permanently installed at the Dyson Building, stands as a lasting symbol of inspiration for current and future students, encouraging them to pursue their own ambitious goals.

Beren Kayali, and Paul Meindieta, co-founders of Deploy Tech, are making significant strides in the water management sector. Deploy Tech focuses on the implementation of innovative water storage solutions that are crucial for addressing climate change challenges. Their technology is particularly valuable in sectors such as drinking water, agriculture, and fire mitigation.

Deploy Tech has developed the first-ever air-deployed, ready-to-use water tank, made with concrete-filled fabric for durability and reliability. This product offers a more sustainable and affordable alternative to conventional concrete tanks, and its design ensures easy transportation and maintenance.

Since its incorporation in June 2020, Deploy Tech has raised over £1 million and received backing from several institutions, including the Welsh government. The company has also won numerous competitions, such as the Santander X Entrepreneurship Awards, further validating its innovative approach to water management.

Through her innovative work with Deploy Tech and her recognition by Innovate UK, Beren Kayali exemplifies the impactful role of women in STEM, inspiring the next generation to pursue innovation and entrepreneurship.

https://dub.sh/IE41-Plaque

Photo courtesy of Deploy Tech

Puraffinity raises £17m

Imperial startup, Puraffinity, which is developing technologies to remove persistent toxic chemicals from water, has raised an additional investment of £6.73 million. This increases its Series A funding round, begun last year, to a total of £16.93 million, resources it will use to scale up production and develop fresh commercial applications for its patented materials.

The company has also appointed water industry veteran Vincent Caillaud as its new chief executive. "The dynamic and pioneering spirit at Puraffinity is inspiring," Mr Caillaud said, "and I can't wait to see what we'll achieve together in tackling one of the most pressing environmental challenges of our time."

The company was formed in 2015 by Henrik Hagemann and Gabi Santosa, at the time both Master's students in the Department of Bioengineering at Imperial. Inspired by their studies, and participation in a competition for new ideas in synthetic biology, they set out to develop materials that would help remove harmful chemicals from water.

Top of their list were perfluoroalkyl and polyfluoroalkyl substances (PFAS), which have since become notorious as 'forever chemicals'. These toxic substances persist in the environment for many years, and have been have been linked to multiple health issues, including cancer.

The founders took part in several Imperial Entrepreneurship programmes, including the Venture Catalyst Challenge and WE Innovate, and the company was among the first residents of the White City Incubator. Later Puraffinity participated in Undaunted's climate accelerator programme, now known as The Greenhouse. Based since then at Imperial's White City deep-tech campus, the company has developed and demonstrated its PFAS removal technology, passing several significant landmarks. Developments this year have proved decisive.

"In the first half of 2024, we successfully shipped our first sales and conducted several lab and pilot projects throughout the year, all of which validated our proof of concept, providing us with the traction to scale further," says Mr Caillaud.

The funding raised in the Series A round will enable Puraffinity to scale-up its manufacturing capabilities, so that production of its PFAS-capturing material can meet demand., growing as government policies on PFAS become stronger and regulations get closer.

https://dub.sh/IE41-Puraffinity

Notpla raises £20m funding

Notpla, the Imperial startup that won the Earthshot Prize in 2022, has raised £20 million in additional investment. The company will use the money to expand its business in seaweed-based packaging, particularly in North America, and to carry out further innovation.

The announcement was made in New York during Climate Week, a joint initiative of the city and the UN General Assembly. Notpla was in town as part of an Imperial Venture Trek organised by Imperial Enterprise Lab and Undaunted, one of a series of missions that take startups and spinouts from Imperial to explore partnership and investment opportunities overseas.

"Since 2014, we've been reimagining packaging from nature's perspective," said Pierre Paslier, co-founder and co-chief executive of Notpla together with Rodrigo Garcia Gonzalez. "This backing proves the growing demand for truly sustainable alternatives and the potential of our seaweed-based technology."

Photos courtesy of Notpla

Notpla founders Pierre Paslier and Rodrigo Garcia Gonzalez

Notpla products are based on seaweed

The Notpla team met while studying Innovation Design Engineering, a programme offered jointly by Imperial and the Royal College of Art. The company developed with support from Imperial's well-established entrepreneurial ecosystem, including Imperial Enterprise Lab, the Venture Catalyst Challenge and Undaunted's climate accelerator programme, now known as The Greenhouse. The company was also a resident in Imperial's White City Incubator.

The investment round, a Series A extension led by UB Forest Industry Green Growth Fund, doubled expectations, despite challenging economic conditions.

"This round not only validates our approach but also positions us to capitalise on the growing demand for truly plastic-free packaging solutions in global markets, especially as we look towards expansion into the US," said Mr Garcia Gonzalez.

"Our investors recognise the commercial potential of our technology and our unique solutions," Mr Paslier added. "This funding allows us to accelerate our growth and continue leading the market in sustainable innovation."

Notpla claims that its seaweed-based packaging has already replaced over 16 million single-use plastic items across Europe. Its products include seaweed-lined takeaway food containers and Ooho, an edible liquid bubble. Its customers include major European corporations such as Compass Group, Decathlon, and Just Eat.

The Imperial Venture Trek that brought Notpla to New York is part of a series of missions intended to introduce founders from the university's entrepreneurial ecosystem to international markets, and help them identify potential new partners and investors. Previous destinations include San Francisco, Accra in Ghana, and Singapore.

Travelling with Notpla on this Venture Trek are Multus, which designs feedstocks for cultivated meats, generative design company ToffeeX, and Cyanoskin, which has developed an algal paint that removes carbon from the air. The delegation is completed by Team Repair, a social impact startup that combines education and the circular economy.

Being in New York for Climate Week puts these companies at the centre of discussions about the global response to climate change. They also have the chance to connect with New York's vibrant startup ecosystem during events and one-to-one meetings.

"Outcomes for this week involve our founders derisking plans to scale, meeting investors, potential customers, suppliers, policy makers, other founders and other climate specialists who can help them move their businesses forward," said Victoria Nicholl, Head of Incubation Services at Imperial, who is leading the mission together with Alyssa Gilbert of Undaunted.

Also in New York for Climate Week are 15 startups traveling with Innovate UK and seven startups with Scottish Enterprise.

https://dub.sh/IE41-Notpla

Professor Mary Ryan (left), Imperial's Vice Provost for Research and Enterprise, celebrates with Notpla in Times Square during New York Climate Week

London Demo Day

Twenty entrepreneurs from Imperial, the London School of Economics (LSE), King's College London, and UCL joined forces at LSE's campus to pitch their startups to investors at this year's London Demo Day.

The annual collaborative event brings together the best and brightest entrepreneurial talent from London's top universities, with each university selecting five startups who are currently in the early growth stage and looking to raise between £100,000 – £2 million. Since 2019, the programme has supported more than 65 startups which have collectively raised more than £97 million.

This year's Imperial startups were:

UpLYFT, founded by Bio-engineering and Biomedical Sciences alumnus Aalok Rai, is a wearable robotics startup that is creating wearable technology to improve mobility, muscle and bone health, especially for older people. Their devices deliver targeted, non-invasive mechanical stimulation to users.

Biofonic, founded by Innovation Design Engineering alumnus Alex Park, is developing new approaches to low-cost pest management and soil regeneration, using acoustic data to provide warnings of hidden soil pests. The startup believes that its technology could help to reduce pesticides by more than 50 per cent and prevent crop loss.

Carbon Cell, led by Innovation Design Engineering, Industrial and Product Design alumnus Elizabeth Lee, is developing a carbon-negative, compostable replacement for plastic-based foam materials. Carbon Cell's carbon negative, non-toxic and fully compostable foam aims to reduce our reliance on expanded polystyrene foam materials.

Matrix, founded by Healthcare and Design alumnus Stiliyana Minkovska, has created a self-use cervical assessment tool which allows women to perform gynaecological exams privately. The tool aims to reduce the need for in-clinic visits, address barriers to screening, and provide immediate diagnostic feedback, supporting early detection, timely intervention, and improved accessibility in women's healthcare.

Phare Labs, co-founded by Global Innovation Design alumnus Arnau Donate Duch, aims to provide two-sided security for rental properties, which are significantly more likely to have issues with water leaks, damp, toxic mould and burglaries than other homes. Phare Labs' technology monitors the most common causes of property loss, aiming to keep tenants' homes safe and protecting landlords' income streams.

https://dub.sh/IE41-DemoDay

STEMulator – now it's your turn

Richard Gundersen (Elec Eng 73-76) has kindly sent us this brief article to bring our readers up-to-date with progress on the STEMulator. As well as being newsworthy, Richard very much wants to remind and encourage Association members to offer responses and contributions. 'Responses' are very welcome and in particular offers to help with publicity, sharing with school children, parents and teachers, sharing with STEM-focussed organisations, and introducing Richard to like-minded individuals internationally. Meanwhile 'Contributions' are also welcome in the form of new, or better, content and, obviously, financial which, Richard points out, could earn CSR credits.

STEMulator.org is a free website to get youngsters excited about the STEM world and careers. A virtual landscape to #ExploreDiscoverLearn. The #HiddenWorldRevealed from pumping human hearts to jet engine turbines.

As chief instigator I have been nurturing this project through to its current state of maturity, which is still quite youthful, with potential for huge growth – which is where our members can play their part.

Our model is based on Wikipedia. We have a proven concept, we've built the framework and can now attract new and better content.

The current landscape covers the home, motor cars, aeroplanes, energy generation, the human being, hospitals, nature and agriculture. Our factory has huge potential for new material and our museum has room for expansion. Currently under construction is our transport tile and mining tile for which contributions would be most welcome.

A typical page includes an informative animation, a labelled diagram, a photograph, short descriptive text and a list of related career options. The STEMulator is not an encyclopaedia, it is meant as a stimulant, to arouse and satisfy curiosity, with links to the wealth of material that is available, curated in an interactive virtual landscape which makes navigation a breeze.

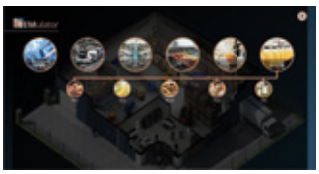
We have added science and maths classrooms to our school which can be tailor-made to country-specific requirements.

Our purpose is to attract more youngsters into STEM fields, both occupationally and professionally. There's only need for one STEMulator, so let's make it a good one!!

Take yourself on a test-drive at stemulator.org, or download the app. It's child's play. I look forward to hearing from our members, be it constructive feedback or offers of new and improved content. And please don't forget to tell every high school student and their parents and teachers. The STEM world offers such a diversity of meaningful opportunities.

richard@stemulator.org

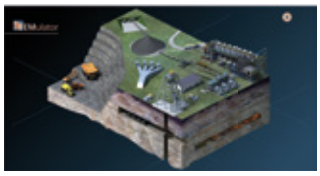
Screenshots courtesy of STEMulator.org



The home screen with various 'tiles' that lead into more details

The museum and the factory

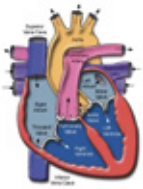
In the school there are classrooms that provide another route through to much of the content

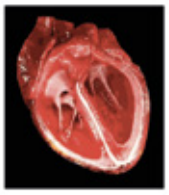


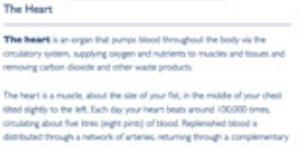
The mining tile

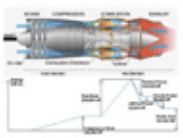
Satellites

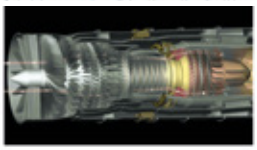
Wind Turbines

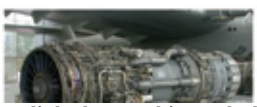












Easy to navigate,click the car on the home screen image and zoom in to the car, click that and it explodes out to show the various parts, click the engine and see the inner workings in action. Or, click the human being to see the different body systems and then how the heart works. Or click to see the aeroplane, the parts, the jet engine.

Triodes 57th Reunion

On Saturday the 18th of May 2024, the Triodes (Electricals graduating in 1973, or there abouts) had their 57th reunion at the 568 bar in the Union Building at Beit Quad.

They are called Triodes, because tri or tria is Greek for 3, they graduated in a year ending in three and of course a triode is an electrical device.

It was their 57th reunion even though it's 51 years since graduation, as in some years they had two reunions.

20 Triodes attended as the photograph outside the Union building shows.

After some hours catching up, Professor Peter Cheung gave them a tour of Electrical Engineering, surprising current students with their presence, showing the Budweiser Organ, the new lecture theatre, the electronics lab and even the pillar that a certain M Hart cracked when he "accidentally" smashed Prof Laithwaite's heavy linear motor into it, at a high rate of knots (we understand the building had to be evacuated until it was declared safe!).

After which Prof Cheung provided the Triodes with tea and cakes in the 6th floor common room.

The next Triode reunion (the 58th) will be at 568 Bar again, on Saturday May the 17th 2025.

The infamous pillar

The Budweiser Organ

Triodes meet current students

The electronics lab

The new lecture theatre

At the back row: Sheila Hiscock, Nick Hiscock, Antony Ardeman, Richard Lewis, Rut Patel, Philip Harris, Simon Pengelly, Peter Marlow, Steve Glenn. Next row: Liz Mansfield, (Professor) Peter Cheung, Caroline Danks, Peter Wright, Jay Yiakoumetti, Graham Castellano, Dave Mansfield, Martin Clemow, Sid Seth. On his knees: Martyn Hart.

Quarterly lunch in Johannesburg

With a mean graduation date at least 50 years ago, the South African branch held their quarterly lunch at the Baron Woodmead on 29th May. Left to Right: John Baker, Richard Gundersen, Charles Lewis, Rod Milne, Andrew Smith.

Volunteers needed to advise students or act as mentors

Alumni are encouraged to engage with students and recent graduates. There are various ways to do so.

CGCA/RSMA events

Both CGCA and RSMA hold social events with departments and the student unions to provide advice and support. Students always welcome hearing about alumni's real-life experiences, to help them decide on their eventual career and to know what to expect from the world of work. Contact the Associations directly if you would like to participate and they will let you know when a suitable event is planned.

Ask an Alum

Imperial College Careers Service runs the Ask an Alum scheme, relaunched in April this year, an initiative which enables current Imperial students to review a database of anonymous alumni profiles and ask one-off questions to alumni about their industry, role and/or prior professional experience.

Registration is required for the service via Vygo. You will be asked a few questions about your career in order to create your Ask an Alum profile. Your contact details will never be viewable on your profile or shared with any students, unless they ask a question specifically for you. You will be given the option to answer four additional questions to create a professional biography that will be viewable to students and alumni via a restricted login area on the College website. This will supplement their enquiries and hopefully encourage a wider breadth of questions.

Once a student poses a question to you, the Vygo platform will email you the requested question and copy in the relevant student for your response. You are requested to respond within five working days of receiving the email. The questions will require around 30 minutes of time to answer, and alumni will be expected to answer up to five questions per calendar year.

This scheme has a rolling registration period. You can register to join the scheme by creating a Vygo account and completing online registration. Details at https://dub.sh/IE41-Ask-an-alum If you have any questions about the scheme, contact the Careers Service team via email on askalum@imperial.ac.uk

Alumni Mentoring Scheme

Imperial College Careers Service also runs the Alumni Mentoring Scheme where an alumni mentor is paired with a student. Students and mentors work together over a portion of the Academic Year with a minimum of four points of engagement. These engagements can be a combination of face-to-face, telephone, email conversations or via an online platform such as Microsoft Teams or Zoom. The scheme supports a structured partnership between an Imperial alum and a current student, whereby the alum can share their professional experiences, personal insights and employability advice. Registration for this academic year have now closed, but if you would be interested in future, contact mentoring@imperial.ac.uk

Imperial Plexus Mentoring

As part of the Imperial Plexus online service, alumni can participate in the Plexus Alumni Mentoring programme – a peer-to-peer online mentoring programme where alumni can connect for a one-off mentoring conversation or for fixed-term mentoring, via Plexus. This is esepcially useful for recent graduates who are trying to plan their career progression. The programme aims to facilitate professional mentoring partnerships. No prior experience of mentoring is required to take part. For those of you who would like to become a mentee or mentor on Plexus, it's easy to get started.

Being a mentee

- Ensure all key details in your Plexus profile are up to date. *Optional*: You can automatically update your profile by syncing with your LinkedIn profile.
- View the mentor profiles which include details about their areas of expertise and the type of mentoring they can offer.
- Submit a request to connect with a mentor of your choice. Remember to include details about why you would like to match with them, how they can help and whether you're looking for one-off or fixed-term mentoring.
- You can match with up to three mentors at any one time.
- Once connected, be proactive in contacting your mentor and be clear about what they can help you with. If you haven't heard back from your mentor within three weeks, contact the Alumni Relations team.

Being a mentor

- Ensure all key details in your Plexus profile are up to date. *Optional*: You can automatically update your profile by syncing with your LinkedIn profile.
- Complete the request form by clicking 'Apply to be a mentor' on the 'Mentoring' page to register your interest in becoming a mentor.
- You'll be notified by email once your request has been reviewed.
- Once accepted to the programme, if a mentee would like to connect, their request will be sent to your email. Ensure email notifications are turned on.
- Click through on the link in the email to accept or decline this request on Plexus.
- You can connect with up to three mentees at any one time.

If you have any questions, please contact the Alumni Relations team on alumni@imperial.ac.uk

A beloved colleague, teacher and visionary engineer

PROF. ROBERT (BOB) SPENCE FREng (Elec Eng 1954-55, 1955-58)

We were deeply saddened by the news of the death of our beloved colleague, Professor Robert Spence, former Head of Department and a pioneer of circuit theory and human-computer interaction.

Bob, as he was known to all, retired in 2000, but remained as a Senior Research Investigator and Emeritus Professor in the Department until his death, and until recently was still supervising student projects.

In 2022, a special celebration was held to mark his 60 years as a member of Imperial staff. Very few people, past or present, could boast of such a long period of service.

Bob was born on July 11, 1933. He started his career in telephony and earned his bachelor's degree from the University of London in 1954. He joined the Department of Electrical Engineering at Imperial College in 1958 as a research assistant for one year, and later returned as a lecturer after a brief period working in Rochester, USA.

Bob completed his PhD at Imperial College in 1959 and was one of the pioneering researchers in the field of electrical circuit theory and communication networks.

During the 1960s, partly thanks to the influential work of his colleague, Professor Colin Cherry, Bob became "very mindful that there was more to communication than circuits" and of the importance of the human element in engineering. He steered his attention to the then relatively new field of interactive computer graphics and human-computer interaction (HCI), and was a true trailblazer in the field, creating many ideas ahead of their time, including co-invention of the "bifocal display" or "fish-eye lens" – a precursor to some of our modern computer desktop features.

Bob saw the potential that interactive computer graphics could have for engineering design, and began research into its application to electronic circuit design.

In collaboration with Paul Rankin from Philips Research Lab, Bob combined his expertise in electrical circuits and computer interaction, to produce an electronic CAD design system known as "Minnie" and, in 1985, founded a company, Interactive Solutions Limited, successfully marketing the first interactive-graphic tool for circuit design.

His interest in exploring new ways of designing interfaces between human and machine continued through the decades, and he was still supervising students in this area until very recently.

Bob served as Head of Department between 1997 and 1999. He was elected Fellow of IEEE in 1976 and Fellow of Royal Academy of Engineering in 1990. Bob was awarded Officier dans l'Ordre du Palme Academique in 1995 and was the recipient of the IEEE's Golden Jubilee Award in 1999. He also held higher doctorates (DSc) from University of London for his contributions to circuit theory and from the Royal College of Art for Interaction Design.

The impact of his work saw him listed as one of the living "Heroes of Computer Science" by the Department of Computer Science at the University of York in 2020.

Bob's research achievements and accolades were accompanied by a passion to educate successive generations of students. He was among one of the most celebrated teachers in the Departments of Electrical and Electronic Engineering and Bioengineering, and he continued to lecture to undergraduate students well into his eighties.

Despite his glowing academic achievements, Bob remained a modest and gentle individual. He was a true gentleman and scholar, and he will be greatly missed by former students, colleagues and friends.

Bob passed away on September 20, 2024 at the age of 91. He is survived by his son Robert and daughter Merin, two grandchildren and a great grandchild.

Based on an obituary by
Professor Peter Y. K. Cheung
https://dub.sh/IE41-Bob-Spence

Bob at the wheel of Boanerges on his way to the Royal Academy of Engineering's New Fellows Dinner in 1993

A valued colleague and one of the most popular teachers

RODNEY JOHN (ROD) GOCHIN (Mining & Min Tech 1963-66)

Born in 1945, Rod began his life-long association with the Royal School of Mines in 1963, when he started as an undergraduate in the Department of Mining and Mineral Technology.

Like many RSM students, Rod spent a significant part of his spare time in the Imperial College bars and it was in the now extinct Southside bar that he first met Jane, a student at the Rambert Ballet School in Notting Hill, who was moonlighting as a barmaid. Rod graduated with an upper-second class degree in Mineral Technology in July 1966 and, later that year, he married Jane on New Year's Eve.

The next day, the newly-weds flew to Canada for Rod to start work as a junior metallurgist with Mattagami Lake Mines, at the company's zinc mine in Northern Quebec.

After a year and a half in Quebec, Rod returned to Imperial College in 1968 to start a PhD in Mineral Technology under the supervision of Dr Joe Kitchener, with the support of a bursary from RTZ. To help the family finances, Jane landed a job as a Bunny Girl at the Playboy Club in Park Lane.

In 1971, Rod was awarded a PhD degree for his thesis entitled: "A Thermochemical Study of the Flotation of Sphalerite and Pyrite."

Armed with his doctorate, Rod left London for a second time to move to the Republic of Ireland for a job with Avoca Mines in County Wicklow, where he rose rapidly through the ranks to become the Mill Superintendent.

After three happy years in Ireland, Rod received an invitation from Professor Marston Fleming at Imperial College, to return to the RSM as a Lecturer in the Mineral Technology department. This was an offer he couldn't refuse and so, in October 1974, Rod joined the academic staff of the RSM, where he was to remain until his retirement over three decades later in 2009.

Rod found that he enjoyed teaching and, as one of the younger members of staff, he had a good rapport with his students and soon gained a reputation as one of the most popular teachers in the Department. As a corollary, he acquired a heavy teaching load over the years.

He was also a good administrator with a proficient grasp of financial matters and, as he rose in seniority, he acted as deputy to several departmental heads of the Mining and Mineral Technology sections of the RSM, such as Professors Tim Shaw, John Archer and John Beddington.

Alongside his teaching and administrative duties, Rod undertook research, not only in classical mineral technology fields like flotation, gravity separation and surface chemistry, but also in collaboration with colleagues in other departments.

One very fruitful collaboration was with Professor John Lester in the Imperial College Centre for Environmental Technology (ICCET), with whom Rod worked for several years on the treatment of waste waters and they published several papers together. Subsequently, Rod carried out research on additives for the control of asphaltene precipitation in oil wells, which led to him being granted two US patents, following which he formed an Imperial College spin-out company, called IC16 Ltd, to exploit this invention.

Rod was also made a director of Imperial College's consulting company, ICON, a position he retained for several years after his retirement from the College's academic staff.

In the late 90s, Rod decided to hone his business skills by undertaking a part-time MBA degree in the prestigious Imperial College Business School. This course is a tough assignment for young,

ambitious, executive types and even more so for a busy academic in his 50s, but nevertheless, Rod successfully completed the course and was duly awarded an MBA degree.

Outside his official duties at the College, Rod acted for many years as Treasurer of the Chaps Club, which he had joined back in 1979, using his administrative experience to keep the club in good financial health.

Since the early 90s, Rod had suffered periodically from a recurring lung problem, which gradually took a toll on his general health and in 2004, as he approached the age of 60, he decided to reduce his workload by moving from full-time to part-time work in the College.

He retired fully in 2009 and he and Jane moved to Eastbourne to live by the sea, where they could concentrate on their favourite pastime of cruising on the high seas.

A couple of years ago, Rod was diagnosed with early-stage dementia and sadly he passed away after a fall in May 2024, just after his 79th birthday, leaving Jane, his wife of 58 years, their two sons, John and Nathan, and three grandchildren.

Rod was a valued colleague and friend; always cheerful, good humoured and sociable. He was a stalwart of the RSM who, in his quiet and unassuming manner, helped to steer that venerable institution through some tough times.

Rod will be greatly mourned by his former academic colleagues, RSM alumni and the generations of students that passed through his hands.

NOTICES IN BRIEF

ROBERT LAWSON (ROBIN) RUSSELL (Civil Eng 1950-54)

Born on January 11, 1932, Robin was a Life Member of CGCA and worked as the Assistant County Engineer for Sussex.

Robin died on July 9, 2022, aged 90.

NEVILLE CHARLES BANCROFT WILSON (Mech Eng 1950-54)

Born on April 10,1929, Neville was a Life Member of CGCA.

He died on March 2, 2024, at the age of 94.

ANTHONY JAMES (TONY) REYNOLDS (Elec Eng 1957-60)

Born on July 25,1936, Tony died on August 18, 2024, at the age of 88.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MOUNTAIN SPIRIT