



Imperial ENGINEER

ANNUAL DINNERS

RSMA BURSARIES

CLIMBING IN ALASKA

ALUMINIUM AND NASA

PLANNING AN EXPEDITION

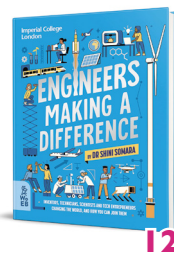
MATERIALS FOR QUANTUM TECH

HOW TO ENGINEER A BETTER WORLD

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

ISSUE 38 *SPRING 2023*

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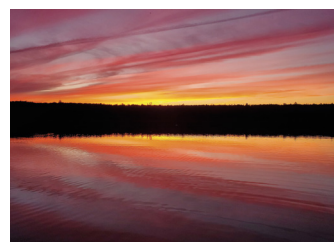
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Cover image
Alaskan sunset viewed from a
lakeside cabin
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Photograph © Cosima Graef

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The warmest of greetings to all of our graduate and incoming CGCA members! I will have seen some of you at the recent dinner, of which we shall hear a lot more in Colin Kerr's article elsewhere in this issue. It was an event that I will remember, and for all the right reasons!

As I am writing this note for the latest issue of IE, I am minded of the rather high degree of resurgent public interest in artificial intelligence (AI), this time driven by the specific form of machine intelligence that is embodied by ChatGPT, its variants and competitors. Indeed, this is not only because the parallels between artificial and biological intelligence are often in my thoughts, but also because the process of drafting text – an activity that would have implicitly been understood as a creative process that could only be undertaken by a human – is now arguably beginning to experience a sea change.

It is becoming clear that there is a small, but not insignificant, number of creative writers who are drafting articles in collaboration with a software agent that can summarise, rephrase or even comment on written text. The use of the agent in this manner seems to range from planning entire articles down to wordsmithing individual paragraphs; it is likely that collaborative approaches to writing scientific articles will follow¹.

It is fair to say that despite clear progress in so-called generative forms of machine learning – those that are trained to synthesise new examples of data given a training set – and the early buds of progress of applying these principles within Large Language models (LLMs), few might have foreseen just how quickly this point would have been upon us. It is estimated that the number of people that have interacted with ChatGPT crossed the 100 million mark within the space of 2 months of its public launch.

The engineering feat involved in training such LLMs is formidable. The BLOOM Large Language Model, perhaps less well known, has been developed and released by a collaboration of hundreds of researchers with the assistance of a generous French public grant; BLOOM was trained on a corpus of just over 1.6 Terabytes of text, spanning 46 human languages and 13 programming languages, and at a cost of 1 million compute hours (and on very efficient Jean Zay hardware², at that) at a footprint of around 25 tonnes of CO₂ emissions. The carbon impact is estimated to be rather less than that of GPT3.5, the LLM that underlies what is currently the most widely used version of ChatGPT, partly due to the use of nuclear power drawn from the French grid (57 gCO₂eq/kWh). The process of data cleaning, model architecture and rationale for building and training BLOOM makes for fascinating reading³.

Continues overleaf...



Anil
Bharath

PRESIDENTS REPORT



Tim
Cotton

2023 could finally be the year that I am able to pass on the President's Medal to a new RSMA President. We have seen a number of new committee members join since last summer and be actively involved in the running of the Association. This bodes well for the future as it will see the Association develop and grow. We are taking our first tentative steps in organising a mentoring program for RSM students with the support of our membership and I sure this will continue to strengthen the bond with the RSMA membership and RSM student body. Hopefully, I will be able to report in more detail in the Autumn Edition of Imperial ENGINEER on both of these items.

Planning is under way for the **2023 Summer BBQ for Final Year Students** which will be occurring on **Thursday June 29th**, the day before the last day of term. A venue is yet to be decided but it is hoped this will be finalised in April. This year the Association and the Trust have decided to split the Annual General Meeting away from the Final Year BBQ in order to allow for an additional social event in the calendar to engage with RSM students. It is planned that the **2023 RSMA AGM will be held on Thursday October 12th**. This will be in the first couple of weeks of the new academic year and it is hoped that this will be a useful event to encourage students to sign up as student members of the RSMA.

Did you know that the RSMA is 150 years old! The RSMA was formed in 1873, initially as the RSM Old Students' Dining Club. As well as a yearly reunion, the aims of the Club were to promote the RSM and to advance its interests and those of its members; objectives which remain to this day. So why not put the next **RSMA Annual Dinner on Friday 24th November 2023** in your diary now? It will be held in the Rembrandt Hotel, Knightsbridge. As part of this milestone year the RSMA is looking to plan an event(s) to recognise the RSMA and will be delving into the Archives for materials to use and promote the RSMA.

In this edition there are a number of reports that I hope will be of interest to you. February 17th and 18th 2023 saw RSM lose the Bottle Match and the Sharpley Cup in Men's Hockey. Men's Tennis and Women's Hockey were the only wins that weekend with the other 5 games in badminton, football, tennis, lacrosse and netball all going to CSM.

Following the recent successes of the annual RSMU/RSMA careers event, on February 6th 2023 the committee once again supported the students with a careers evening. It was organised by the current RSMU Hon Sec Reha Chandresh and was an interesting and engaging event.

The committee continues to maintain a very active relationship with the RSMU and key societies within the RSM such as Geology, MatSoc and GeoPhysicsSoc. All of them are Represented on the RSMA Committee meetings and the RSMA provides financial support where needed. These Clubs and Societies are the life blood of the RSM and it is very pleasing to report that these organisations managed to maintain a very active schedule of virtual events throughout the year. As mentioned earlier all organisations enjoy, and want more, interaction with the wider alumni group.

Continues overleaf...

NEWS & REVIEWS

Anil Bharath, continued from page 3

I am not using any forms of AI as I write this, or at least, not to my knowledge; this is partly due to a feeling that it would be cheating, but also due to the fact that one has to know how to coax sensible and stylistic sentences out of LLMs, and that is beyond my current skill set.

The incoming generation of engineering students will absorb these new LLM-based tools into their repertoire of techniques and skills for design, coding and engineering analysis. They will have to: the genie is out of the bottle, and the best we can do is to figure out how to harness it to achieve our goals and wishes, and to ensure that on balance, the genie's capabilities are used for the benefit of people and humanity.

1. Buriak, Jillian M., et al. "Best Practices for Using AI When Writing Scientific Manuscripts: Caution, Care, and Consideration: Creative Science Depends on It." *ACS Nano* (2023).
2. <http://www.idris.fr/eng/jean-zay/jean-zay-presentation-eng.html>
3. Scao TL, Fan A, Akiki C, Pavlick E, Ilić S, Hesslow D, Castagné R, Luccioni AS, Yvon F, Gallé M, Tow J. *et al*. "Bloom: A 176b-parameter open-access multilingual language model". arXiv preprint arXiv:2211.05100. 2022 Nov 9.

Tim Cotton, continued from page 3

In the 2023 Autumn term the RSMA Trust awarded three £1000 bursaries to final year students. All of this year's winners, as well as those from past years, are a shining example of students who have demonstrated true RSM spirit and uphold the values of the RSM by giving comradeship, help and advice. This is now the fifth year running that the Bursaries have been awarded and 19 students have benefitted from the tremendous generosity of RSMA members. This is a significant example of how you are directly supporting students at the RSM. Remember ALL the funds for this Bursary have been raised by YOU through your kind generosity at events and specifically by those members who have supported the 100 Club. This is an amazing achievement and is concrete example of former students of the RSM who want to give back to the current student body. Lastly the 100 Club is slowly growing and I would encourage you, if you are able, to sign up and support the RSMA via the 100 Club or by a one off donation. The Committee has recently setup different ways to allow members to support the 100 Club, for example offering a monthly direct debit to spread the cost. Read on for a piece from the three new RSMA Final Year Bursars and how you can sign up and keep helping the RSM students.

I hope you find this issue informative and I look forward to seeing some of you in the RSM and/or at an RSMA event in the near future. Lastly, many thanks for your support, it is truly appreciated. The RSMA is always looking to attract more Committee members so if you can spare a few hours every couple of months please do get in touch. Remember you can all still use the email address rsma@imperial.ac.uk to contact the RSMA at any time. Please send us your news and we will look to share it with the wider RSM Community.



Visit the Great Exhibition Road Festival to celebrate the power of awe and wonder to inspire us, motivate change and spark innovation. Discover an exciting range of events lined up with something for everyone, including free hands-on workshops, fascinating talks, music performances and installations from iconic museums, research and culture organisations, including Imperial College London, the Natural History Museum, Royal College of Music, Science Museum, V&A, Royal Albert Hall and many more.

- Open to members of the public
- Free to attend
- You don't need to register in advance, but if you do, you'll receive programme updates and event information, and be the first to hear when free tickets are released for popular events.

Adult highlights

Discover the future of food at live shows, create your own space poetry, step back in time to the original Great Exhibition of 1851, and watch incredible artworks inspired by Imperial College London research come to life over the Festival weekend. Plus, you can indulge in food from all over the world and enjoy eclectic performances from the Royal College of Music and Royal Albert Hall on the Main stage.

Family favourites

Extract DNA from a strawberry, hear about the biggest dinosaurs that ever lived, or step into a world of virtual reality! Explore the oceans in an adventure into the deep or the molecules that are all around us at live interactive family shows, build your own recycled robot. Enjoy storytelling, demonstrations and more on the family stage!

<https://www.greatexhibitionroadfestival.co.uk/>

Alumni Weekend

The best way to enjoy the Festival is by purchasing a pass for the Alumni Lounge, an exclusive space for you and your guests to enjoy on the South Kensington Campus.

- Only available to Imperial alumni and their guests
- Small charge to register, giving you access to exclusive tours, early-bird talk tickets and free refreshments all day
- Registration is required – registering for the Festival does not give you access to the Alumni Lounge

By purchasing a pass for the Alumni Lounge in advance, you will receive priority access to the Great Exhibition Road Festival's fascinating talks programme, as well as an opportunity to book onto exclusive tours for alumni and your guests.

Alumni Lounge

With so much going on around South Kensington, the Great Exhibition Road Festival will be bigger than ever. The Alumni Lounge is your home from home, your place to escape the crowds, avoid the queues and take a breath.

The Alumni Lounge is your first port of call for registration and a useful meeting point for you and your guests and fellow alumni. The Lounge will be fully stocked with tea, coffee and snacks all day, and

there's plenty of seating so please feel welcome to bring your lunch or a picnic.

Alumni Lounge opening hours:

Saturday 17 June: 10.30–17.30

Sunday 18 June: 11.30–16.00

Smart Machines Zone preview

If you purchase an Alumni Lounge pass for Saturday or the Weekend, you can access an exclusive preview of the Smart Machines Zone showcasing innovation in robotics and AI, an hour before it opens to the public on Saturday. Meet our researchers before it gets busy, and explore the ground-breaking projects on display.

From robotic friends and revolutionary tech to green transport innovations and smarter AI, inside the Smart Machines zone you can explore how humans and machines will interface, interact and influence the future.

In our cities of tomorrow, discover smart-road concepts and intelligent wheelchair technologies before driving around a virtual South Kensington where autonomous vehicles are the norm. You can then take to the skies with teams making green air travel and space exploration a reality.

The exclusive alumni-only preview will take place on Saturday 17 June, 11.00–12.00. The preview is not available on Sunday.

<https://www.imperial.ac.uk/alumni/events/alumni-weekend/>

DIARY

As a result of the recent COVID-19 pandemic, some events may still be virtual or hybrid. Although most local restrictions have been lifted or relaxed, before considering attending any event, please contact the organisers to check any restrictions that may be in place.

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
(17th May, 16th Aug, 15th Nov, 21st Feb 24)
Baron & Quail, Woodmead, Johannesburg, South Africa
Contact: Richard Gundersen – Gundersen@yebo.co.za

CGCA

AGM + President's Evening

Monday, 5th Jun 2023, 17:00 for 17:30
South Kensington campus

RSMA

Summer BBQ for Final Year Students

Thursday, 29th Jun 2023
Union Bar, Beit Quad

RSMA

AGM

Thursday, 12th Oct 2023
Union Bar, Beit Quad

RSMA

139th Annual Dinner

Friday, 24th Nov 2023
Rembrandt Hotel, South Kensington SW7 2RS

Imperial Engineering Alumni

Traditional Reunion Luncheon

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

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

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

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

CGCA Annual General Meeting

The CGCA Annual General Meeting, AGM, will be held on Monday, 5th June in room LT201, Skempton Building (aka Civ Eng) at Imperial College's South Kensington campus.

Refreshments will be available on arrival for the AGM from 17:00 outside the room.

Before the AGM, your President, Professor Anil Bharath, will present a talk addressing "How will the Next Generation of Engineers Harness Artificial Intelligence?" (17:30 to 18:30).

The AGM will start at 18:30 and run for 30 minutes. With the 'business' part of the evening complete, the President's Evening will begin at 19:15, with a drinks reception, followed by hot food with beer / wine / soft drinks.

The AGM will include a review of the last year by Anil, presentation of the Association's accounts for 2022 and then move into elections of the Association's Officers. All positions except President, Vice President and IE Editor will need to be elected to serve in the 2023–24 academic year. A proposal for a free membership tier will also be presented.

If you wish to stand for any Committee post, please email the Honorary Secretary on Guildshs2018@outlook.com with your name, membership details and identifying the post (or posts) you wish to stand for. We are particularly interested in finding a Deputy Honorary Secretary, and always need Departmental Representatives for the eight engineering departments in which the ACGI is awarded on graduation. You must currently be a member to stand for a role.

The President's Evening is a relaxed social event that gives you a chance to meet the President and other officers, and to catch up with other members. Guests are most welcome for the President's Evening.

Attending the AGM and Anil's talk in person is free. A pre-booked ticket is needed for the President's Evening and further details can be found on our website at <http://cgca.org.uk/agm>

You can join the AGM and talk, remotely, using the ZOOM platform. Details to do this will be on the same link.

Please note the venue at College for the President's Evening is yet to be confirmed, so please check the above link for the latest details.

Nigel Cresswell
CGCA Hon Sec

CGCA "5&10" Reunion Lunch

The traditional CGCA "5&10" Reunion Lunch took place on Saturday 19th November 2022 at the Polish Club, directly over the road from Imperial's C&G Building. Held in a private dining room with views over Princes Gardens, lunch was a tasty, shared selection of Polish starters, a choice of three main courses, and a variety of tasty desserts. The event was attended by a total of 28 alumni, their partners and guests, including six students. Nicola Pogson was also able to join us, from Imperial's Alumni Relations department. Nicola's department supports our event by paying for aperitifs, which is very kind of her and Imperial.

The oldest members present were Walter Sedriks (Chem Eng) and Andrew McGrath (Elec Eng), both 1962 leavers. Along with Chris Lumb (Elec Eng, 58-61), who has helped organise the event for many years, they were able to sit together and reminisce about life at a time when post-war austerity was finally beginning to loosen its grip on the country.

As is customary at these lunches, several alumni spoke, between courses, of life in their time at College. We were delighted to have a group of seven 1972 Aeronautics alumni, brought together by the superb efforts of Phil Brading. Between our starters and the main course, Phil gave us memories of their time at College in the very early seventies (see picture below). He was followed before dessert by Chris Read (Elec Eng 83-87). Finally, Denise Wong – this year's CGCU Alumni Liaison officer, gave everyone an idea of what life is like at College today, after which we all had a Boomalaka!

That was not the end, however; Bo had been brought to the foot of the building in Princes Gardens and many went down to look over

him. Bo had major renovation work, during 2022, of both mechanicals and body – financially supported to the tune of some £20,000 by many alumni who contribute to the Old Centralians' Trust "Bo' Fund". The previous weekend had seen a not entirely successful Brighton run for Bo. As the day progressed more and more difficulties appeared due to the very recent recommissioning, and eventually the endeavour had to be abandoned. The bonus for those present was that this meant Bo was pushed to the venue, with gearbox internals on full display (see photo).



Photos courtesy of Peter Chase and Chris Lumb

David Law (Mech Eng 69-73), who had himself organised the reunion lunch for many years, had come along in his father's period "driving coat", originally for a Model T Ford! (see photo below) It's strange to think Bo pre-dates this fine item of apparel by at least 10 if not 20 years!

As ever, it was great to see old friends reunited and enjoying each other's company at the Reunion lunch. Dear readers, please note! If it's "your" year this year (i.e. you left in a year ending 3 or 8) then why not come along on Saturday 25th November? See the enclosed booking sheet for more details, or the CGCA website.

Peter Chase



Phil Brading (Aero 69-72) regaling diners with stories about life at college in the early 70s.



David Law (Mech Eng 69-73), had come along in his father's period "driving coat", originally for a Model T Ford!

Disappointment at the 2023 Bottle Match Weekend

February 17th–18th was the Bottle Match Weekend in London and unfortunately the results did not favour RSM:

- The Bottle was not retained as, even with RSM dominating play, it was a draw (17 pts all) meaning CSM, last year's winners, retain the Bottle.
- RSM lost the Sharpley Cup in Men's Hockey (1-2); 2 late CSM goals in the last 5 minutes sank RSM's hopes.
- There was success in Men's Tennis with a win to RSM, as was Women's Hockey (2-0); but the rest (Badminton, Women's Tennis, Football, Netball and Lacrosse) were all CSM wins.

See below for some additional commentary.

Women's Hockey:

The RSM women's hockey team kicked off the day's sport with enthusiasm and intensity, providing an electrifying 70 minutes of fantastic hockey. Despite the early start, the strong crowd presence ensured a great atmosphere.

Watertight defence, strong saves from Emma in goal, energy and drive in the midfield, and single-minded determination from the forwards, led the ladies to a well-deserved win. 1-0 up by the end of the first half, the team stayed calm and continued to deliver, with a spectacular second goal from Helen securing a solid 2-0 victory.

Despite CSM's confidence in their team's strength (to the point of not bringing the trophy with them to London), the Golders cup will be returning to its rightful place in the Union Bar this year for the first time since 2014!

Netball

Another year of Bottle done and

with a 9-62 result, we couldn't be prouder of RSM Netball. We managed to keep CSM under 100 and more than 6 goals!! Smashed it.

Our players never let the energy drop and even gave CSM something to panic over when we led the first quarter 2-0 up! Thank you to everyone who stayed out in the rain to watch us play; as always, the RSM sideline support was unmatched.

We'll be continuing the fight next year. It's time for double digits. Look out Bottle 2024.

Badminton:

With a hastily put together team we managed to win a few games but CSM had some strong opposition, who displayed impressive skill and teamwork. Our team suffered a defeat but gained valuable experience. Men's were 6-2, women's were 6-2, and mixed were 7-2, all to CSM, but all our teammates showed a cracking effort despite all the last-minute scrambling to find players!

Men's Hockey:

Following on from the women's impressive victory, the pressure was on for the men's team. CSM came out the gates hard but thanks to the brilliant efforts of Marshy (Materials), Jimmer (EPS) and Sammy (Geophysics) we managed to hold off their attacks. Like Michael Rosen's 'We're going on a bear hunt', CSM could only go through the middle but our midfield stopped them in their tracks. A couple of questionable decisions from the chuckle brothers (correction, umpires) and half time came about at 0-0. The halftime team talk by captain/leader/legend has been compared to some of the great speeches of history (think Winston Churchill mixed with Obama) and

the troops were raring to go. Not long after these words, Ed James finally arrived and put one of his flick's top bins. Things were looking up and it seemed like the age-old question of whether CSM could do it at a windy day in Harlington had been answered... The game started

to get a little bit feisty but luckily Barry and Paul kept a firm handle on the game. In the final moments of the game CSM put two in the net – a heart breaking way to lose. We will come back stronger next year. However, every year we prove – IT'S ALL ABOUT THE HOCKEY.



Photos courtesy of RSMU



RSMA Annual Dinner November 2022

137th Annual Dinner was well attended!

As in past years, the 137th annual dinner was held at the Rembrandt Hotel in Knightsbridge on Friday 25th November 2022. This year saw 107 members and guests join the Committee, of which 45 were current RSMU students. As is always the case, the members of the RSMA were extremely generous and sponsored 34 of the students attending. After a welcome drink or two, all the guests sat down for a traditional festive dinner of a ham hock terrine, turkey (with all the trimmings) and a mini crème brûlée dessert.

This year the RSMA was especially delighted to have Dame Sue Ion to speak to our assembled members and guests. Dame Sue received the prestigious Dame Grand Cross award in the Platinum Jubilee Honours for services to engineering. Sue's background is in materials science/metallurgy. She gained a first class honours from Imperial College in 1976 and a PhD in 1979 before joining BNFL where she was Group Director of Technology 1992-2006. She holds Visiting or Honorary Professorships at a number of universities including Imperial College and the University of Manchester. She has represented the UK internationally on key committees overseeing the nuclear sector for over 3 decades.

Photos by Tim Cotton



She is a Fellow of both the Royal Academy of Engineering and the Royal Society where she chairs or is a member of a number of subcommittees. She was Chair of the Nuclear Innovation Advisory Board for the Government from 2015-2018 and is currently Hon-President of the National Skills Academy for Nuclear.

Dame Sue's speech was well received by all the guests both young and old, her message about sustainability was passed on in such a fun, yet impactful manner. Reha Chandresh (RSMU Honorary

Secretary) commented "It was an enjoyable speech with some great anecdotes! Yes, we will definitely follow the advice on making the most of our time at university and making amazing memories with our friends!"

Dame Sue was equally enthusiastic commenting that "it was a lovely evening and (I) remade contact with various people from way back." She was "also so impressed by the students and especially the number of women."

Unfortunately, the Association was unable to present any of the three available awards due to lack of nominations of suitable candidates.

To close out the formal part of the evening, the 100 Club Draw was conducted and this went to Nick Holland from the USA who after the dinner very graciously re-donated the prize back to the Fund. The support of the 100 Club members cannot be overstated as they have allowed the Association to be able to award three £1000 bursaries to penultimate year students to assist them in completing their final years at RSM. See the article in this magazine describing the latest three bursars.

Danny Hill, a RSMA Committee member, gave a toast to the guests who included the Heads of Department from Earth Science and Engineering, Professor Tina Van De Flierdt; Materials, Professor Sandrine Heutz; the President of the City and Guilds Association, Professor Anil Bharath; and President of the City and Guilds Students Union, Kia Popat.

Finally, it was left to Josephine Onerhime, the RSMU President, to close out the evening with a few words and the Mines Song. Afterwards guests and students stayed and mingled in the room before heading to the bar.

END NOTE: During the dinner one of our members was taken seriously ill and had to be taken to hospital by paramedics. The Association is delighted to report that the member made a full recovery and was able to travel home later in the evening of the dinner. The Association is very grateful to the members and guests and hotel staff who dealt with this incident in the middle of dinner service with professionalism and genuine compassion.



CGCA ANNUAL DINNER 2023

The Association's 109th annual dinner took place on Friday 24 February, returning to the Carpenters' Hall, an old favourite for the choice of venues. Following the very impressive turnout of 146 people for the 2022 dinner, we did very well again with a turnout of 133, which included a strong representation of students and recent graduates, in addition to the members who regularly attend the social highlight of the Association's year.

The principal guest was Professor Wen Wang, Vice Principal and Executive Dean for Science and Engineering at Queen Mary University of London, a PhD graduate from Imperial's Department of Bioengineering. He spoke enthusiastically about the power of engineering to enhance human freedom and creativity and to bring benefits to every continent, even extending into space, the planets and the galaxies.

He stressed the importance of Engineers and their role in finding and implementing solutions in vital aspects of human life, including water supply, energy, transport, medicine and environmental protection. He made special mention of the work of engineers in the medical domain, referring in particular to the use of novel materials for bone grafts. He stressed the role of the UK as a powerhouse in these advances, with Imperial as one of the main leaders, producing a better life for many. He also spoke affectionately of his time at Imperial, with fond memories of Bob Schroter, Colin Caro and other tea-room friends, the atmosphere of open-mindedness and understanding in the College and his gratitude for the time he spent in South Kensington. He closed his remarks by proposing a toast to the City and Guilds College Association and the Faculty of Engineering.

Anil Bharath, the President, spoke briefly about the activities of the

Association over the past year and introduced the Association's special guests, including Patrick Craven, representing the City and Guilds of London Institute and Dr Chris Webborn, representing our sister body, the Royal School of Mines Association. He closed his remarks with the traditional toast to the guests, encompassing the

Association's special guests and the friends and family of the members.

After proposing a toast to the guests, the President added a very special toast, to one of our senior members, a previous President and long-time supporter of the Association and its annual dinner, David Hattersley, in order to mark his 90th birthday.



David Hattersely, who was toasted to mark his 90th birthday.

Photos by Jaime Parra Raad, except where indicated otherwise



Boanerges was present, delivered rather than driven by Benton Stevens and his crew, due to a last-minute clutch problem which meant that the journey to Carpenters' Hall had to be made with the assistance of a van and trailer. Even so, Bo appeared shortly before the start of the dinner, and members had a good chance later in the evening to see the outcome of the recent renovation programme, reported in previous issues of IE. Bo looked in excellent shape (apart from the clutch!), parked outside the main entrance to the Hall.



CGCA President Anil Bharath welcoming other CGCA officers. Clockwise from top left: Atula Abeysekera (CGCA Immediate Past President); Nigel Cresswell (CGCA Hon Secretary); Peter Chase (OC Trust Chair); Chris Lumb (OC Trust Immediate Past Chair).



The President and his Top Table Guests, with Spanner, Bolt and their bearers.

Following the speeches, the President introduced the student awards, which were presented by the College Consul for Engineering, Professor Ann Muggeridge, to Ms Liv Walthaus, Mr Benton Steven, Mr Allan Lee (see right).

Mr Alexis Montet, Department of Mechanical Engineering, was awarded the Holbein Memorial Award 2021-22, Sportsman of the Year. Alexis was not able to attend in person to receive his award, but will be invited again next year.



Ms Liv Walthaus, Department of Bioengineering, presented with the John and Frances Jones Prize 2021-22 by Prof. Muggeridge.



This year's Bo Driver, Mr Benton Steven, Department of Mechanical Engineering, receiving the Peter Moore Memorial Award 2022-23, from Prof. Muggeridge.



Mr Allan Lee, Department of Bioengineering, presented with the FCGI Centenary Award 2022 by Prof. Muggeridge and Commodore Barry Brooks.



Photo courtesy of Paulina Chan

Paulina Chan, Vice Chair of Hong Kong branch of CGCA, with Colin Kerr, CGCA Annual Dinner organiser; Carly Lench, Alumni Relations Office; and Nicola Pogson, Director of Alumni Relations at Imperial.



Guest speaker Prof. Wen Wang enjoying reception drinks with Chris Lumb.



When intense concentration is obviously required.



CGCU President Kia Popat about to lead the Boomalaka.



Past and present CGCU Officers, reminded how heavy mascots are!



RSMA Trust 100 Club Final Year Bursary enters its 5th Year



Tim Cotton, President of RSMA, with this year's recipients of the RSMA Final Year Bursaries

The 100 Club continues to be a success and thanks to the generosity of the 100 Club members, over £42,000 has been raised to date. Since the 100 Club started in 2016, 19 final year students have benefited from this generosity; this includes 3 bursaries each of £1000 awarded in 2022. Remember, the 100 Club does not sponsor RSMU sporting or social activities – those sponsorships are solely in the domain of the RSMA.

Here are 3 brief articles written by each of the 2022 winners. These are a wonderful testimony to the Club's objectives and we ask that you please consider supporting your college, the Royal School of Mines. This is a great opportunity to give back to the Royal School of Mines, of which we all have many fond memories, and to positively support today's generation of students. Let us not leave the support to the hard core few.

So, if you can commit, in any way, it would be very much appreciated by the students, staff and the RSMA.

Chung Yan (Crystal) Fu

I am Crystal, a third-year BSc Geology student. I am very honoured and grateful to receive the 2022 RSMA 100 Club Final Year Student Bursary Prize.

The RSM has been integral to my journey at Imperial. Starting university in the middle of the pandemic was daunting, but the Union's warm welcome made me feel right at home. Even during lockdowns, the RSMU brightened my days with fun events like virtual escape rooms and online dinner parties. As COVID restrictions eased, I was delighted to finally meet everyone in person and to get involved with the RSM societies and sports clubs. I enjoyed training weekly with the RSM Badminton Team and participating in the RSM Olympics. As the Treasurer of the Geology Society, I helped organise the Fresher's Trip and the Annual Symposium, which connected students and provided opportunities to network with professionals. As the Head of Marketing of the

Geology for Global Development Society, I also publicised lunchtime talks, which facilitated discussion between students and academics.

Throughout my studies, the RSM has been my home away from home. Remembering how my RSM "mums" had helped me find my feet when I first joined the College, I signed up to become a "mum" myself and looked after a couple of first-year students as they settled in. It brought me much joy when my "kids" declared that we were the "best family ever", and I am sure they will continue to pass on the RSM spirit. I enjoy sharing all these amazing experiences with prospective students while representing the Department of Earth Science and Engineering in Summer Schools and Open Days, in hopes that more talented and passionate students will join the RSM family in the future.

With the RSM being such a central part of my university life, receiving the RSMA Bursary in recognition of my contributions to the community really meant a lot to me. It has alleviated my financial

burden during the cost-of-living crisis and allowed me to dedicate more time and energy to RSM activities in my final year, alongside completing my dissertation project. It has also enabled me to apply for master's degrees and other postgraduate opportunities more confidently, bringing me closer to my academic and career goals. The rest of the funds will be used to subsidise a self-guided trip in Spain, which will be a chance for me to test my Spanish in real life after three years of learning, as well as to make up for the missed field trips to Almeria and Pyrenees due to COVID.

My undergraduate experience would have been incomplete without the RSM. I would like to thank everyone I have met in this loving community for making my time here so memorable, and for the RSMA for their continuous support in our activities. Thank you again for the generous award you have given me, and I hope to remain a part of and give back to the RSM in the future.



Chung Yan (Crystal) Fu

**Antoinette Mallon****Antoinette Mallon**

I'm Antoinette, a final year MSci Geology student. During my time in the RSM, I have been involved in a number of activities, I was vice-captain of the woman's RSM Hockey team for two years, played at two Bottle Matches and I have been involved with the Imperial College Geology Society as Secretary last year and President this year. I have been enjoying my time as President of the Geology Society even though it has been difficult at times. The society successfully co-hosted a speed mentoring event with the YMP (Young Mining Professionals) and is getting ready to host its annual Symposium entitled 'Sustainable Geoscience' in March. The society also received a generous donation from the RSMA this year for which it is very thankful. I have had a lovely time in this department, as it has offered many opportunities including fieldtrips, being an undergraduate teaching assistant and being able to enjoy many of the RSMU events.

I'm very grateful to have received the RSMA 100 Club Bursary Prize, as these funds have enabled me to enrol on a pottery course for 11 weeks at Morley College London which is something I have wanted to do for a while. This has improved

my final year as I have been able to unwind and enjoy using my hands and creativity. I am thinking of using the remaining bursary funds to travel to South America this summer before I start working. It was also a lovely token of appreciation of my involvement with the RSM.

My future plans are not exactly set out yet but I'm thinking of either becoming an environmental consultant somewhere in Europe or becoming an exploration geologist possibly in Australia.

Alex Jones

Hi! I'm Alex, a final year Earth and Planetary Geologist. I've loved being involved with the RSM since I joined Imperial in 2019. From leading the squash team down to Cornwall for the Bottle Match to running activities for students as RSMU Outreach Officer, the RSM has been a central part of my university experience. As such, I'm honoured and thrilled to have been awarded one of the Royal School of Mines Association's Final Year Bursary Prizes.

Whilst on committee in 2020-21, I loved engaging young people in Earth Sciences by organising activities like "Find the Meteorite" and building

**Alex Jones**

earthquake resistant towers, to help raise awareness for the importance of geosciences today. After the pandemic hit and I was no longer able to carry out 'normal' outreach, I decided to start focussing on public engagement through social media instead. By creating short, engaging videos, I've been able to reach a much wider audience and help draw attention to Earth and Planetary sciences. I was particularly grateful for receipt of the bursary prize to help pursue this further. The bursary has allowed me to dedicate more time to creating videos in recent months, which otherwise would have been spent working. It's also allowed me to invest in professional editing software, and better filming equipment. This has helped me improve the quality of my content significantly, and I've now been able to reach over 8 million views across my videos!

Academically, I have been busy so far this year with my MSci project, investigating the preservation of biomarkers in Mars analogue iron-rich sediments. My project looked at whether biosignatures of primitive microbial life can survive through four billion years of storage in rocks similar to those on Mars, by artificially ageing terrestrial

analogues in the RSM labs! This is hoped to inform the Mars Sample Return campaign, and whether we should consider selecting rocks rich in iron-oxides for Earth-return and further analysis. Next year, I'll be continuing down a similar path as I analyse data from the Perseverance Rover over the course of a PhD project – staying in the RSM with the Mars Research Group!

Being awarded the 100 Club Bursary Prize this year has helped me enjoy my final year. It has allowed the RSM to remain at the core of my university experience, ensuring any spare time outside of my degree can be enjoyed getting involved with events organised by the committee – from Bottle Match to Spring Dinner.

I am hugely grateful to the RSMU for all the joys they bring to university life, and the hard work they put in to making the RSM a fantastic place to be. I would like to once again thank the RSMA for awarding me one of the bursary prizes this year, and for their recognition of my work and contributions to RSM-life throughout my time here. I look forward to being a part of the RSMA and to continue supporting the RSM in years to come!

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

Imperial professors elected as Fellows of the Royal Society

Professors Andrew Davison (Department of Computing) and Andrey Golutvin (Department of Physics) will join more than 70 other members of Imperial staff who have been elected as Fellows of the Royal Society.



Photos courtesy of Imperial College London

Professor Andrew Davison is Professor of Robot Vision at Imperial and leads both the Dyson Robotics Lab and the Robot Vision Group at Imperial's Department of Computing.

Professor Davison has made foundational contributions to computer vision in the areas of real-time structure and motion recovery from video sequences. Since the 1990s, he has pioneered the mapping technique Simultaneous Localisation

and Mapping (SLAM), using cameras to give robots a 3D 'awareness' of the spaces around them. He brought the SLAM acronym and methods from robotics to single-camera computer vision with the breakthrough MonoSLAM algorithm in 2003, which enabled long-term, drift-free, real-time SLAM from a single camera for the first time.

The work inspired many researchers and industry developments in robotics and inside-out tracking for virtual reality and augmented reality. This, together with his algorithms for reconstructing the surfaces of objects and scenes, is now routinely used in robotic applications, and has also influenced the development of the augmented reality industry on mobile devices.

Professor Davison's main research interests are now in improving the performance of robot vision in terms of dynamics, scale, detail level, efficiency and semantic understanding. At the Dyson Robotics Lab, he leads a team developing computer vision algorithms that will enable robots to move beyond their controlled environments and successfully navigate and interact with the real world. They equip robots to

overcome challenging real-world situations such as large indoor or outdoor environments and varying lighting conditions, and teach robots to manipulate real-world objects for applications in service robots.

He said: "I am delighted to become a Fellow of the Royal Society, and am grateful to all of the students, colleagues and collaborators who have contributed to my work. I feel both the honour and responsibility of representing computer vision and robotics as scientific disciplines, especially at the current time when these technologies are increasingly impacting people's lives."



Professor Andrey Golutvin in the Department of Physics, is recognised

for his outstanding international contributions to the study of 'heavy flavour' quarks, known as charm (c) and beauty (b) quarks. He has played a leading role in several ground-breaking experiments in heavy flavour physics since the 1980s. He is now working on the Search for Hidden Particles (SHIP) experiment at the CERN Super Proton Synchrotron accelerator.

Fellowships are given to distinguished scientists by the Royal Society in recognition of "contributions to science, both in fundamental research resulting in greater understanding, and also in leading and directing scientific and technological progress in industry and research establishments."

Sir Adrian Smith, President of the Royal Society said: "I am delighted to welcome our newest cohort of Fellows. These individuals have pushed forward the boundaries of their respective fields and had a beneficial influence on the world beyond. They are pioneering scientists and innovators from around the world who have confounded expectations and transformed our thinking."

<https://bit.ly/IE38-NewFRS>

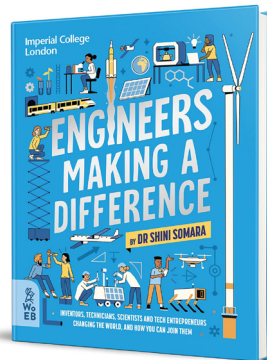
Imperial publishes new book to inspire engineers of the future

Imperial College, with support from the Gatsby Charitable Foundation, has collaborated with What on Earth Publishing to create an inspiring new book, *Engineers Making a Difference: Inventors, Technicians, Scientists and Tech Entrepreneurs Changing the World, and How You Can Join Them*.

Two years in the making, the book and its associated resources are now published, with school kits heading to every state secondary school in the UK. These free school kits contain two copies of the book, a Teacher's Guide, 12 hot topic posters, and a 4-metre-long timeline wall chart.

The kit has been designed to be a valuable resource for schools in the delivery of their career guidance plan against the Gatsby Benchmarks Framework – a framework for good career guidance developed to support secondary schools and colleges in providing students with the best possible careers education, information, advice, and guidance. Activities in the Teacher's Guide will provide opportunities for teachers to bring the engineers' stories into the classroom.

Authored by mechanical engineer, broadcaster and producer



Dr Shini Somara, *Engineers Making a Difference* showcases 46 creative individuals from across the engineering world.

The book and its supporting resources are designed to introduce readers aged 12–15 to the opportunities a career in engineering could bring them. From apprentices at the start of their careers and tech startup CEOs, to professors with Royal Academy Fellowships, the engineers profiled in this book demonstrate the ways that engineers make a difference in the world.

Through brightly illustrated pages, readers discover how the engineers

found their way into the industry, their inspirations and how their work makes a difference. The book is intended to show young people that engineering is an industry for everyone, profiling engineers from a range of backgrounds, disciplines and industries.

Included in the book are Imperial professors Michele Dougherty, Tom Ellis, Aldo Faisal and Molly Stevens. Also included are Imperial alumni, such as Pierre Paslier, co-founder of sustainability startup Notpla, Dr David Trevelyan, who can be found transforming audio at TikTok, and Dr Ugur Tanriverdi, whose *unhindi* startup is helping to change the lives of those who wear prosthetics.

In addition to the printed resources, a series of 15 case study videos has been produced, allowing readers to get a glimpse into the engineers' everyday lives and learn how they're making an impact through their work. This includes hearing how apprenticeships have made a difference to some of the engineers, going inside the Joint European Torus in Oxford to discover the secrets of fusion energy and listening to how Earthshot Prize-winner Pierre Paslier is making

the world more sustainable through their innovative biodegradable food packaging.

Imperial was chosen as a collaborative partner for the project due to its reputation as an outstanding STEM university, with an exceptional strength in engineering, and its commitment to achieve enduring excellence in research and education in science, engineering, medicine and business for the benefit of society. The project also highlights the College's ongoing commitment to widening participation in higher education.

Professor Maggie Dallman, Imperial's Vice President (International) and Associate Provost (Academic Partnerships), said: "Engineers, inventors, technicians, scientists and tech entrepreneurs all contribute to the field of engineering which needs diverse minds, bringing a range of perspectives and skills, to solve global challenges.

"This exciting project will show young people the engineering that is all around them and that they too can be part of solving these challenges."

<https://bit.ly/IE38-Book>

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

Royce Facility for the materials of the future

Imperial's new Henry Royce Institute (Royce) Facility has launched to identify challenges and stimulate innovation in advanced materials research.

The work will generate new materials for quantum technologies, materials for the energy transition, healthcare and information technologies.

Located in the Sir Michael Uren Hub Building at Imperial's White City campus, the facility offers state of the art equipment to support new research on advanced materials. Supported by the Henry Royce Institute, the facility forms part of the Royce 'Atoms to Devices' theme and will deliver innovation at every stage of fabrication, taking advanced materials from their building-block atoms to fully functional devices.

The facility welcomes collaborators from across industry and academia, offering use of its pioneering equipment and technical expertise.

Advanced materials like biomaterials, smart materials and

nano-engineered materials possess unique properties, enabling superior performance to their traditional counterparts and are critical in a wide range of industries including health, transport, energy, electronics and utilities.

Examples include single-molecule sensors that can aid drug development and medical diagnosis, more efficient data storage, bespoke textiles for fashion and medical applications, and new ways to deliver vaccines without using cold storage.

Professor Sandrine Heutz, Head of Imperial's Department of Materials, said: "Most people probably don't give much thought to all the materials that make our lives possible – whether that's the semiconductors powering our phones and tablets, or the fuel cells and solar panels driving the transition to zero pollution.

"Improving the materials we use can make a huge difference to the way we produce clean energy, manufacture medicines and vaccines, boost the efficiency of transport,

and even communicate with one another."

The facilities will specialise in the generation of thin films for sensors and other electronic devices, patterning and milling, electrical testing, and understanding the chemical and physical properties of advanced materials.

Innovations already in development at the facility include antimicrobial surfaces on which bacteria and viruses can't grow, and mRNA vaccines that can be kept at room temperature so they can be more easily stored in resource-limited settings.

The Royce at Imperial team has been instrumental in driving forward an initiative called Materials for Quantum, which develops materials for quantum applications and has resulted in an EPSRC funded Network. The team has also partnered with Royce Partners University of Manchester and the University of Leeds, to develop the Nanoscale Advanced Materials Engineering (NAME) EPSRC

Programme Grant, which aims to revolutionise the design and delivery of functionality on demand at the nanoscale within advanced materials.

Imperial College London is a Partner of the Henry Royce Institute, which is funded by the Engineering and Physical Sciences Research Council, part of UK Research and Innovation.

The Institute supports world-recognised excellence in UK materials research, accelerating commercial exploitation of innovations and delivering positive economic and societal impact for the UK.

The Institute operates as a hub and spoke model, with the hub at The University of Manchester and spokes at the founding partners. The Royce partners include the universities of Sheffield, Leeds, Liverpool, Cambridge, Oxford and Imperial College London, as well as UK Atomic Energy Authority and National Nuclear Laboratory.

<https://bit.ly/IE38-Royce>

Department of Materials launches Centre for Cryo Microscopy of Materials

A unique cryogenic microscopy facility has opened to enable new discoveries about materials critical to the energy transition.

Imperial's Department of Materials has launched its new Centre for Cryo Microscopy of Materials, the only facility of its kind globally. The multi-microscopy facility has cryogenic specimen preparation, transfer and analytical capabilities and cutting-edge equipment to investigate nanoscale materials.

Supported by the EPSRC, the facility will focus on researching energy materials for catalytic systems and batteries, as well as materials for soft and hard matter interfaces and biological systems. Moreover, the facility aims to act as a collaborative hub for scientists to address the UK's goal of achieving a sustainable zero-carbon future.

Professor Mary Ryan CBE FREng leads the College's *Transition to Zero Pollution* and is a co-investigator on this project. She comments: "The new facility builds on the unique legacy of Imperial as a world leader in electron microscopy and in the application of frontier analytical tools aimed at solving real-world problems.

"We are already gaining new understanding about complex materials systems including nitrogen-reduction catalysts, battery materials and magnetocaloric alloys – and we are just beginning to be



Photo courtesy of Imperial College London

able to deploy the full range of capabilities. We are looking forward to working across Imperial and with the wider materials community in the UK on some truly exciting and important challenges."

Professor Sandrine Heutz, Head of the Department of Materials, said: "The team have done a fantastic job putting this project together, building up the complex infrastructure and integrating the new equipment with other state-of-the-art characterisation and fabrication tools in the department.

"This will create a unique environment for the understanding of the structure, composition and function at the nanoscale, and I look forward to transformative discoveries and collaborations to tackle today's grand challenges, in

particular our transition to net zero."

The imaging methods used in 'regular' electron microscopy setups are often inadequate – and sometimes damaging – for visualizing elements such as hydrogen, lithium, carbon, and sulfur due to their lightweight and high mobility, making them prone to change or move during specimen preparation or imaging. However, the new facilities in the Centre for Cryo Microscopy of Materials will enable researchers to investigate these elements from the micro- to the atomic scale and in a quantitative manner by 'freezing the atoms in place' and preserving interfacial environments.

Using the facility, researchers will be able to use a unique approach of combining techniques such as

transmission electron microscopy, atom probe tomography, and cryogenic and vacuum transfer between instruments. The aim is to develop a comprehensive understanding of these materials, which have crucial roles in the transition to a sustainable future society – including hydrogen production and storage, battery technologies, and the decarbonisation of industrial processes, as well as a range of challenges at the engineering-medicine interface.

By using this new approach, researchers will be able to adapt the imaging methods to suit the specific characteristics of the materials being studied and achieve a detailed understanding of them at various levels.

Professor Baptiste Gault and Professor Finn Giuliani are co-leading the new facility. Professor Baptiste Gault commented:

"It's fantastic to see how much has been achieved, from a concept devised three and a half years ago to finally seeing instruments being used, early-career scientists developing skills and knowledge and starting to deliver game-changing results."

The objective of the facility is to function as a collaborative centre where scientists can work together for a sustainable, zero-carbon future.

<https://bit.ly/IE38-CCMM>

Planning an Imperial expedition

We often feature student expeditions that have been supported by the OC Trust and/or the RSMA Trust. In the summer of 2022, six graduates and students went rock climbing in Alaska (see page 16). The expedition leader, Isabel Jones (Physics 2018-21), wrote an article advising students about planning an Imperial expedition, which offers a fascinating insight into the effort that goes into planning an expedition.

Overview

Imperial has an exploration board that provides funding and guidance on planning an expedition. Expeditions can range from cycling through France and sport climbing in China to big wall climbing in Madagascar or kayaking in Georgia. They can be as crazy and ambitious as you like or stay relatively on the beaten track just so long as the trip will push you out of your comfort limit in some way and won't put you in unmitigated danger. In this article, I will explain my experience planning an expedition to go alpine and rock climbing in Alaska. I will also talk about the expedition itself!

Part 1: The Planning

I had always been more of a follower. Friends of mine would think up adventurous weekends or sometimes longer excursions. I would tag along, get a lift there, borrow their equipment, and laugh at all their jokes as a thank you. But as I had graduated from Imperial, I wanted to plan an adventure of my own and it was my last year to be eligible for funding from the Exploration board (you are eligible up to one year after you graduate). So, partly inspired by the movie and book *Into the Wild*, I set my sights on heading to Alaska.

Deciding on the location and what you want to do can be relatively tricky. It can require a lot of creativity and research if you don't already have something in mind. The expedition leader of Bolivia, Charlotte, wanted to go bouldering somewhere in Asia but it would've been Monsoon season. Therefore, someone suggested she look into south America. She trawled through the google search results of 'bouldering in south America' until coming across an obscure article suggesting there was a vastly unexplored bouldering location in Bolivia. She checked it out on google earth, it looked cool, and thus an expedition was born. In my case I knew I wanted somewhere green and leafy with big mountains, I thought about Patagonia and New Zealand until ruling them out because they would've been in the wrong season. Alaska was the next choice.

Once you have chosen the location and activity, you can go to the first step (and first anxiety) of planning the adventure, finding a team that will join you¹. For Alaska, I put out a message on the Imperial mountaineering social media pages outlining what I wanted to do and the prerequisites for anyone that wanted to come. Silence followed for what probably wasn't that long but felt like a while until I eventually got some responses! I even had to turn down a few people in the end! It was mad. The first anxiety was over and replaced with unbridled excitement.

Then came the challenging part for someone who is usually a follower, I was being followed! *What do I do now???* I thought. I had done so much research by this point though, carried by the wave of excitement of having my own adventure, that by the time the team had its first meeting I could answer most questions and give good groundwork information as to how the expedition might go. And as everyone discussed what they would like to get from the trip and their expectations, more clarity on how to proceed ensued. They were happy. I was happy. Big excitement.

There were lots of boring logistical things we had to consider next like how to apply, when to apply, what you need to apply, and examples of successful applications. Luckily, it could all be found on the exploration board website! Just google Imperial exploration board. The board members are also very helpful in answering questions, their contact details can (you guessed it) be found on their website.

To make an analogy most Imperial students could get behind, I saw planning an expedition kind of like coding. You have an end goal and a method of getting there, but as you start coding there is bug after bug after bug. All of which you did not foresee. It's kind of like that, problem after problem after problem. *Grrr why hadn't I thought of these things at the start??* You will think to yourself. It's a frustrating process, especially when you are balancing all the various desires of your team members. Although, then again, maybe I'm just bad at coding.

I won't go into the nitty gritty of the problems we faced when planning Alaska, as they are all pretty unique to what we were trying (equipment, finding routes, approaches, BEARS). If you plan an expedition you will likely have your own unique challenges when organising it. This is just a note to say you should expect them, especially if you are trying something ambitious.

What started for me as a three week challenge that I'd save up my holidays from work to undertake, turned into "I'm going to quit my job and go climbing for 5 months and spend all my free time planning it". You might have a small 2 week trip to somewhere accessible, or it might consume you. Be prepared.

Part 2: The Expedition

The time spent in Alaska itself was roughly 5 weeks. The team's arrival was staggered as everyone spent a stint in the alps beforehand on the Jonathan Conville alpine preparation course.

The first day was rather delirious and perhaps set a precedent for how the trip would ensue. Ben and I were the first to arrive, and wanting to make the most of the weather in the alps, decided to do routes the day before our 7 am flight to Anchorage. He and his team mate had an epic and did not get off their route until 2am. At the last minute they managed to find a taxi driver who would drive him from a small village in France back to the campsite to frantically pack his belongings and then drive him an hour or so on to Geneva airport. I made it to the airport at around 11pm wearing the same clothes I climbed in and the same sweat. Sleep became impossible as I stressed about the others and tried to figure out a backup plan, Ben had the tent! He arrived just in time at around 4:30am.

After we miraculously arrived in Alaska, we travelled straight from Anchorage to a small village called Talkeetna. Having dinner in that small hippy town that looked like it was straight from a great western movie felt like a fever dream. Jake arrived a day or two later after choosing a cheap flight that took 2 days with numerous layovers. The week was spent completing the planning for the expedition (by going to the rangers office, talking to mountain guides, and liaising with the air taxi), eating lots, and drinking with the locals. When the



Photo by Benjamin Jones

Lots of planning involved

rest of the team arrived, it was a day or two of frantic preparations as we got everything ready to spend two weeks camping on Pika glacier.



Photo by Isaac Blanc

During the flight on the little plane that had only 6 passenger seats, my mouth was hung wide open. I had never seen so many sharp and rugged granite pillars condensed in such a small place, poking out of soft snow. It looked like a playground for rock climbers. It was a beautifully clear day, we stepped off the plane, put our belongings on sledges, and dragged them over to where we would set up base camp a few metres from the glacier air landing strip.



Photo by Isaac Blanc

It would take me much too long to write everything we did on the glacier in this article (we were there for 16 days!), but check out the extracts from our trip report in this magazine, or download the full report² if you want to see what routes we climbed and a day by day break down of what we got up to. The key things that stick out for me from that time are: each peak took roughly 20 hours (time didn't matter so much in the land of the midnight sun), when we weren't climbing we were either asleep or stuck in the tent because it was raining, our base camp was incredibly beautiful.

² <https://bit.ly/IE38-Alaska>



Photo by Miguel Boland



Photo by Benjamin Jones

And of course the end of our time on the glacier when we were stuck in the tents for an extra 4 days with the weather having turned so bad that the pilot couldn't come and collect us. When he did finally get us he only had a 1 hour window, otherwise we would've been stuck for another 5 days (ish). We also ran out of all the nice food by this point and nobody wanted to cook as it would mean getting drenched. So it was nuts for breakfast, nuts for lunch, and if we were lucky, rice and beans for dinner.

This part of the expedition will stick in my mind for a long time. The sheer beauty of the glacier meant I was in an almost constant state of awe. Also there was the mental strain of living on it – not really from boredom or isolation but rather the risks that constantly surrounded us. After completing a route, I always felt lucky when we returned to base camp. Like I would cherish my life that little bit more and it was always my brain, more than my body, that needed a few days of rest before venturing back out from the safety of our tents again. The glacier also deteriorated more and more as we were there and by the end rock fall noises were almost constant. These noises served as reminders of the risks around us.

But we survived! And when we finally made it back to non-cravassed land, lots of rest was in order. We then wanted to go rock climbing without being surrounded by risks so set out to climb in Alaska's finest crags!

Unfortunately, the glacier wasn't the only place where the weather was bad. It was raining almost everywhere in Alaska. Fairbanks was the only dry place so we decided to brave the 6 hour drive and check it out. Bad idea. Worst decision I made as expedition leader. If I could describe the climbing in Fairbanks with one word it would be **mosquito**. Swarms of them! My deepest apologies to Ben who had to spend his last few days of Alaska in Fairbanks. Still, there was a nice museum.

Things perked up after a few days in Fairbanks as the weather was looking good in Hatcher pass for a week! Really good actually. I had messaged the author of the guide book for Alaska climbing, Kelsey Gray, asking him for advice of where would be good to go when its raining. There wasn't really anywhere to go (as can be seen by the fact we went to Fairbanks), but it did mean we were now in contact with the legendary Kelsey Gray!

He was insanely friendly and we ended up climbing with him for that week. He let us stay in his cabin, taught us how to clean and bolt routes, taught us how to fish and smoke salmon, and was really fun company. We bolted a route and did a team first ascent, naming it 'A Nightmare of Black Bears'. We actually even saw a black bear (it was terrifying).



Photo by Isaac Blanc

And that was that! I am so grateful that we got to do something like this, and so proud of the team for how much we learnt and what we pulled off! Thank you to the Imperial exploration board for encouraging and supporting these adventures.

Expedition to Alaska

In the summer of 2022, six graduates and students went rock climbing in Alaska, supported by the OC Trust. This article is based on extracts from their extensive expedition report.

Alaska's latitude is between 54 and 73 degrees north and located to the west of Canada. The main regions of focus for this expedition include Denali National Park (specifically Pika Glacier), and Hatcher Pass, located in the Talkeetna Mountains.

Pika Glacier, roughly 4.5 miles long and at an elevation of roughly 1200-1800m, is an offshoot of the famed Kahiltna Glacier, the latter holding the most popular basecamp for Denali. Pika Glacier is in the middle of an area known as 'Little Switzerland', so named by a pilot for its supposed resemblance to the Alps, and provides both the airstrip and basecamp for the surrounding peaks and glaciers. Little Switzerland is a popular destination for climbers on their first expedition in the Alaska Range, due to many of its peaks having relatively straightforward approaches and amenable climbing; the Alaska Mountaineering School (AMS) often runs glacier travel and Alpine climbing courses there. Popular easier peaks include Middle Troll and The Throne, with harder objectives being Royal Tower and Crown Jewel, among many others. There is still a great deal of unclimbed rock, and new routes are still being put up, such as some hard aid routes up the imposing South Face of the Throne.

Hatcher Pass itself is located at an elevation of 1,184 m (3,886 ft) in the south-west part of the Talkeetna mountains, and can be accessed directly from Anchorage via car. It is a rather remote area best known for its hiking trails and technical rock-climbing. There are a few small private land holdings in the area, however most land is public and frequented by skiers, hikers, mountain bikers and climbers. During the skiing season (late September to April), Hatcher Pass is one of the most popular and easily accessible backcountry skiing regions in the area, due to it offering one of the longest ski seasons in North America. The area contains a mixture of traditional and sport climbing routes with a variety of jagged arêtes, hanging valleys and glaciers characterising the terrain.

In early July, these regions of Alaska get 19 hours of daylight. The remaining 5 hours of each day are twilight, during which one can see clearly without a torch. This is a mixed blessing, as it makes benightment impossible but can lead to disorientation and poor sleep.

ARRIVAL IN ALASKA

Day 1 – Thurs 30th June

After a lot of planning and many multi-mode, noise-filled meetings, it was finally time to head to Alaska. Ben, Izzy and Jake had set off to Anchorage a week early. Unfortunately, the group had received some last-minute information from the mountain guide they had been talking with, which made much of

the initial itinerary impossible. Furthermore, the guide was no longer able to climb with them. This meant that a full expedition plan did not exist when the trio arrived in Alaska. However, they went straight to Talkeetna from the airport, where they would be trapped for a week (no one could drive). But they found lots of information from extremely helpful Talkeetna employees and locals that couldn't be found online. They alerted the rest of the team that there was a new, very exciting plan and spent the week making sure it was possible.

Flying over Iceland, Greenland and Canada, Cosima, Miguel and Isaac eventually obtained a great aerial perspective of the snow-covered Alaskan mountain ranges looming beyond miles of desolate tundra. After so much planning, it was surreal to see such a foreign and lonely landscape – home of the midnight sun.

Day 2 – Fri 1st July

The sun was already (or still?) shining when Isaac, Miguel and Cosima went to Costco to buy 14 days of food for 6 people (around 252 servings).

Once at the campsite in Talkeetna, the 6 of us were finally reunited. We walked down the main street towards the Susitna river, for a direct view of Denali (Mount McKinley). This is the highest peak in North America at an impressive 6,190 metres (20,310 ft). We sat by the river and discussed our next steps. With a 5-8 day storm imminent, we weren't sure about flying to Pika Glacier. Ultimately, we decided to ask the park rangers and AMS first thing in the morning.

PREPARATION IN TALKEETNA

Day 3 – Sat 2nd July

Miguel and Cosima woke everyone up to start preparing for our day of errands! It really felt like we were on a detective mission, first stopping by the AMS building and then the park rangers office to ask questions about the weather conditions on Pika Glacier. The woman at AMS told us weather forecasts were not to be trusted in this area and that it had (very unusually) not rained in the region in 2 months.

We registered our details with the park rangers as a safety precaution and quickly put together a to-do list: taking a food inventory and planning meals, buying more food, getting glacier toilets, sorting the air taxi booking, laundry, charging electronics etc. We also brought all 317kg (700lbs) of food to a large wooden hangar next to the air taxi airport to weigh and pack. It was an incredibly tiring day but definitely the hardest part of glacier preparation over.

Day 4 – Sun 3rd July

Game day! After weighing gear, we had a

final meeting. The weather forecast was iffy and we were wary of getting stuck somewhere remote in bad conditions. We all voted to fly out, accepting that the weather might turn our climbing trip into a camping trip. Just being on the glacier would be worth it.



Photo by Cosima Graef

We flew over marshlands and into striking, granite mountains untouched by human infrastructure and spanning as far as the eye could see. The flight was just 30 minutes long but equivalent to 5 days of hiking. Now, we were truly remote. The landing was smooth and, once off the plane, we got the first glimpse of our new home. Massive, looming faces of granite looked over us with watchful eyes from all directions of the glacier. With mystical names like 'The Throne', 'The Crown Jewel', 'Middle Troll' and 'The Hobbit's Foot', it all felt very Tolkienesque. The sun was bright as we unloaded our gear and three tourist planes were landing just next to ours. We'd soon find out that tourist planes visited this glacier multiple times a day, removing some element of remoteness, yet offering a sense of welcome safety as well.

After unloading what we thought (and were told) was all 900lbs of gear and supplies, we roped up for glacier travel and went in search of a basecamp. We pulled sleds, loaded with our gear, and used a probe to check for crevasses.



Photo by Cosima Graef

BASECAMP

Day 4 – Sun 3rd July (continued)

At basecamp, we started digging out an area for our tents, the kitchen, our food and our bathroom with shovels. We used special snow pegs for our tents and put all food on a tarp so the cardboard boxes wouldn't get soggy. There was a wall between the kitchen and bathroom area for privacy, although this wall ended up melting each day. We dug out a

pee well which got deeper with use, and set up our CMCs (clean mountain containers) which were portable toilets to prevent human waste polluting the glacier. Although in practice, this really just meant they were plastic buckets to poo in which we had to bring back out of the glacier with us when we left.

Whilst setting up camp, we quickly realised that the 6 gallons of fuel we had bought from Talkeetna Air Taxi didn't get loaded onto our plane. It was already nighttime (although with 24/7 daylight this was hardly noticeable) so we decided Isaac would call them the next morning. Fortunately, we had backup JetBoil fuel and a plentiful supply of freeze-dried meals, that would last us for a week.

Despite the forecast, the weather on the glacier was stunning. Indeed, we spent more time worrying about sun cream than storms. As Ben boiled water for supper, the sun re-emerged from behind the Royal Tower and its rays caught in the steam. The air was crisp, the sky was clear and we could see to the Kahiltina Glacier.

We roped up as a team of 6 and explored the region next to The Munchkin. It was a great feeling to be on the glacier, especially since the conditions were so much better than expected. However, we soon turned back at the sight of a serac hanging over the next region of the glacier. It was the height of a London tower block and several times wider. With time, we came to refer to it endearingly as 'Death Serac' but left that region of the glacier unexplored.

Day 5 – Mon 4th July

In the morning, we met two ski mountaineers also staying on the glacier who stopped by our camp to say hello on their way to check the weather. Apparently you could get phone signal at the top of a slope behind our camp.

Once the fuel arrived, we got the Omnifuel stoves working and made pasta with bell peppers, sauce and parmesan. Mmm, very yummy.

We planned the next day to make the most of the good conditions, choosing two routes we had discussed with AMS. They would involve a lot of scrambling and a few pitches of climbing at grades well within our ability. We had also discussed these routes with AMS, so felt they were a good starting point.

With plans made for the following day, Isaac, Ben and Jake still felt restless, so went to scout the approach for the Southwest Ridge of The Munchkin. At this early stage of the trip, the glacier felt unfamiliar so the trio were cautious and turned back when they saw dark depressions in the snow that they suspected were weak snowbridges.

Once back at camp and in the warmth of their sleeping bags, the team listened to the sound of rockfall. These sounds became a staple part of glacier life but were always unsettling. We tracked where they came from, in order to avoid these regions. For instance, this was why we never attempted Gargoyle Buttress.

The objective of the expedition was to spend five weeks in Alaska, travelling between Anchorage, Pika Glacier, and Hatcher Pass from the 30th of June until the 1st of August. The team consisted of the 6 members below. Our aims were:

- To develop our alpine climbing skills and improve rock climbing skills on different terrain;
- To gain experience with remote expeditions, including the logistics of self-reliance;
- To discover new bouldering routes in a large boulder field in Hatcher Pass and document online to encourage more climbers to the area;
- Create a documentary of the trip and share to younger club members to inspire them to pursue more adventurous climbing activities;
- To learn about the cultural history of the mountains we are visiting.

TEAM

EXPEDITION LEADER

ISABEL JONES

- BSc Physics Graduate 2021
- ICMC Social Secretary 2019-2021
- Trad E2, sport 7a, bouldering f7a
- Lead grade II Scottish winter
- Trad/sport multi-pitch up to 300m in Scotland and Europe



Photo by Isaac Blanc

WEATHER OFFICER

JAKE LEWIS

- MEng Aeronautical Engineering Graduate and 1st Year PhD in High Speed Aerodynamics
- ICMC Social Secretary 2020-2022 and Treasurer 2022-2023
- Trad HVS, bouldering f7a
- Lead grade II Scottish winter, seconded grade III



Photo by Isaac Blanc

MEDICAL OFFICER

BENJAMIN JONES

- Medical Student
- BSc Remote Medicine Graduate
- ICMC Webmaster 2021-2022
- Trad E2, sport 7a+, bouldering f7b.
- Some alpine experience, 4000ers and guiding Bolivia 2019 exped alumnus



Photo by Miguel Boland

WRITER-PHOTOGRAPHER

COSIMA GRAEF

- MEng Biomedical Engineering Graduate and 1st Year Neurotechnology PhD Student
- ICMC Secretary 2019-2021
- Trad HVS, sport 6b+
- Lead grade II Scottish winter
- Trad/sport multi-pitch up to 130m across Europe



Photo by Cosima Graef

DRIVER

MIGUEL BOLAND

- 2nd Year Maths PhD Student
- ICMC Postgraduate Secretary 2022-2023
- Trad E2, sport 7a, bouldering f7a
- Trad and sport multi-pitch in UK, France, Spain, Switzerland, Indonesia
- Triathlon and Ultramarathon enthusiast



Photo by Cosima Graef

FILMMAKER

ISAAC BLANC

- 3rd Year Mechanical Engineering Student
- Trad HVS, sport 6a
- Lead grade III, 4 Scottish winter
- PD+ to 6000m with a guide
- Week-long trekking and cycling expeditions



Photo by Isaac Blanc

FEATURES

SOUTH FACE OF MIDDLE TROLL

Day 6 - Tue 5th July

We woke up at 8am to prepare for our big route day. We packed our gear, food and water, and agreed to text base camp at midnight to check in on our progress. There wasn't much water left so Miguel and Cosima only took 1 bottle each. Big mistake. It was going to be a sweltering day climbing on a south facing wall and they both ended up severely dehydrated. Roped up with snowshoes on, the pair started the approach to Middle Troll.

Since she was lighter, Cosima led the way to the bergschrund crossing. Ice axe in one hand, walking pole in the other, it was hard work climbing up the snow slope. The weight of the rope coils around their chests and the trad rack weighing down their harnesses, made it even more challenging to find their footing in the slushy snow. Eventually they made it to the bergschrunds. It was absolutely terrifying trying to gently step across a snow bridge, whilst also not losing their footing. Cosima ended up breaking off parts of the snow bridge and climbed into the smaller bergschrund. Once at the rock, she built an anchor and belayed Miguel up only to find that the next sections of rock were all loose choss. Dehydrated and tired, Cosima felt quite lightheaded so Miguel ended up leading the rest of the 400m route. The first few pitches consisted of chossy scrambling. Technically not that difficult, but not trusting anything you stepped on or held onto made for slow progress. Even though Miguel checked the topo regularly, without any points of reference, it was difficult to navigate up the 3rd/4th class scramble. The snow cover was much less than usual for ascents of this route, meaning the guide lacked details which were now exposed to the elements. They passed a lot of tat anchors, but rather than reassuring them they were on route, just added to how confusing route-finding was. The route finally turned into really enjoyable granite climbing with great holds to pull on, things to push up on, and incredible views. Eventually they made it to the top around midnight after 14 hours of climbing – the midnight sun still shining brightly.

Coming down was where things got fruity... Rather than follow the recommended descent, they started abseiling back down the same anchors from their way up, which included some diagonal abseils, and short climbs up buttresses between abseils. Two hiccups occurred. Miguel abseiled down and back up a small buttress, causing

Cosima (who was last down) to become stuck in the small trough, unable to ascend or descend the rope. A short stint of rope soloing ensued, and Miguel re-joined Cosima to help her untangle the ropes and take an easier way down. The second hiccup occurred when the rope popped over a rock, causing Cosima to flip and hit her butt and head before regaining control. Thankfully, the only scratches were to our egos, as we found our snowshoes, abseiled over the bergschrunds in the nicer fashion and made it back to base camp at 6am, after 20 hours. What a relief. We saw the sunset from the top of the route, and the sunrise on our walk back.

THE LOST MARSUPIAL

Day 6 – Tue 5th July (meanwhile)

On the day of the Lost Marsupial, Isaac and Izzy left camp at about 9am. Izzy had suggested a more alpine start of 5am so that the bergschrund crossing would be less slushy, but Isaac had stayed up late the night before to attempt the Munchkin and thought an early start unnecessary. When he led over the bergschrund, however, both team members were slipping and sliding the whole way up as the snow was too slushy! They got to the base at around 12pm and it was very very hot.

The first 5.8 pitch was an extension to the climb for when the gully has too little snow to be safe to climb, so you exit onto the rock sooner. They were glad the conditions required this because it was a splitter crack and lots of fun. The second crux was a few pitches later and was a super nice lay back. After this second crux, the grades were low, so Isaac and Izzy simul climbed the rest. Unfortunately, the rock got looser as the climbing got easier so the best climbing was in the first half of the route. They reached the summit 400m later at about 7pm. The sun was still high in the sky and the views were stellar so they sunbathed for half an hour to an hour and collected some snow to melt and put through a water filter. At that point, they did not realise how long and arduous the descent would be, with lots of rappelling and down climbing over scree in between abseils. When they walked back over the glacier to the tents it was sunset and the twilight sky was lined with orange and red. They arrived at camp, tired and hungry, at around 2am.

Jake and Ben had decided they wanted to try a smaller objective before attempting one of the larger peaks, so went on a scouting mission to find the "Hobbit's Footstool", an area supposedly containing some shorter routes.

some even bolted. They eventually found this – passing the skiers' abandoned camp on the way – and then continued down the glacier towards the Kahiltna, turning back when the terrain became more crevassed. They then returned to the camp, to spend the evening worrying about the other two teams (luckily unnecessarily).

Day 7 – Wed 6th July

We started our rest day today, taking the day to prepare for the rain we were expecting. Although it was a rest day, there was always something to do at camp. Washing dishes, maintaining our bathroom privacy wall, making water, going to CMC, sorting gear. We put snacks in each tent and Miguel and Cosima spent the entire day melting and filtering snow to drink and cook with.

The weather was not as bad as we expected, but by the end of the day, big clouds had come in from all directions. We were glad to have stayed at camp. With the weather changing and our day busy with errands, we were finally realising the scale of our undertaking. We really were in the midst of a mountain range! On a proper mountaineering expedition! All by ourselves!

Day 8 – Thu 7th July

It was raining all day so we took shelter in our tents.

THE HOBBIT'S FOOTSTOOL

Day 9 – Fri 8th July

It was supposed to rain again today but, with a clear sky in the morning, we decided to take the risk and journey to the base of the glacier to The Hobbit's Footstool. Porridge in our bellies, gear in our packs, and our favourite expedition member (the drone) on Isaac's sled, we set off under the scorching sun. We crossed at least 15 crevasses on our way there, with some crossing basecamps long abandoned from earlier in the season.

When we finally arrived, we had a hard time figuring out if we were in the right place. Jake, Isaac and Izzy decided to climb up some rock and scramble to what they suspected were the single and multi pitch routes we were looking for. Miguel, Ben and Cosima were still dubious about this, and retraced their steps to head further down the glacier. The rock there looked even less like the topo so they had to walk all the way back.

By the time they made it up the scramble, the others were already halfway up a 4-pitch (YDS 5.6, 5.5, 5.10, 5.6) route named 'AMS Arête'. It was a classic

American 'half trad, half sport' affair. The first two pitches were nice easy climbing on natural gear, with one awkward (but short lived) flared corner. These were followed by a stunning and very well bolted arête, leading to another pitch of naturally protected crack climbing.

After lunch Ben, Cosima and Miguel started up the same route. Cosima abbed down after the second 5.8 pitch while Ben and Miguel continued. Izzy became our new videographer and shot some interviews while waiting for Ben and Miguel to finish.

Around midnight, the whole group abbed back down to the snow and returned to camp. Cosima led the way, dreaming of the delicious mac and cheese they would make. The sky was displaying its most mesmerising sunset yet, the dark red streaks contrasted vividly against the black silhouette of The Dragon's Spine. Back at camp we discovered ravens had raided our bin bags and trash was strewn everywhere. We'd forgotten to bury our trash so spent the next half hour doing that. We made mac and cheese to warm up but were met with a horrendous surprise. It was by far the most abysmal, disgusting creation any of us had ever eaten. Too bad we had bought 24 packs of the sour, yellow sludge!

Day 10 – Sat 9th July

It was raining again today so we all huddled up in our tents once more. Except this time, we definitely smelt worse. Most of us had been taking wet wipe 'showers', but they were rather futile. Miguel found the ravens had managed to dig up our buried trash (again) and so we braved the rain and dug even deeper holes. Tea, water filtering, eating way too many mixed nuts.

THE MUNCHKIN SOUTHWEST RIDGE

Day 11 – Sun 10th July

The weather was uncertain today but, having had the munchies for The Munchkin since we got here, today seemed like the day for it. Izzy wasn't feeling well so stayed at camp to rest, poor soul. The other five of us roped up for the risky approach, stopping by the tourist planes to ask about the weather forecast. The pilots were unable to give us any indication of the weather to come, but we certainly made it into a bunch of tourist photos in the process of asking.

We zigzagged across the crevasses to not be parallel to them and reached a deep bergschrund at the base of The Munchkin. Isaac was brave in leading across it to the rock, to then belay the rest of us up. After seeing how deep the berg was, the rest of us had

newfound respect for Isaac's boldness. Despite being on belay, Ben managed to partly fall into the berg, which amused Cosima so much she slipped on the snow from laughing too hard.

Once on the rock, we split into 2 teams. Jake and Isaac, and Miguel, Ben and Cosima. We weren't quite on the route so the latter team went right, on some loose rocks, whereas the other two stayed left to avoid rockfall. Once almost at the top of the route, gentle rain started drizzling on top of us. At the Munchkin's peak, Jake found a nut labelled 'AMS'. Since we weren't technically on an established route the climbing was exploratory with an air of mystery of what was to come.

Isaac led us in prayer to the abseil gods before pulling the ropes after the last 60m ab. Fortunately, they took pity and the ropes came without snagging – a real blessing. We walked back to camp in our snowshoes after an enjoyable faff-free day of climbing. We were in luck! Despite being unwell, sweet Izzy cooked our best meal yet: pasta with peas and the creamiest, cheesiest, garlickiest white sauce. A day well spent despite the unpredictable weather.

THE PLUNGER AND LOST MARSUPIAL

Day 12 – Mon 11th July

It was around 10pm when Isaac and Izzy decided to bail off a route to the left of The Plunger because the rock was too loose for their liking. Bad weather seemed to be rolling in, but the fog appeared to dissipate just as it hit the ridge, which created an atmosphere that somehow made it much more exciting. They thus decided to traverse onto the Plunger, eager to get to the top of something (and because it looked so so cool!!!). They didn't have a topo but had read somewhere that there were amenable grades, so off they went.

After Isaac led a lovely 5.6 pitch, they were met with a steep crack. The crack had a fairly consistent width which was ever so slightly too narrow to get a good hand jam in (even for Izzy's relatively small hands). After pulling on and doing the first two moves, it was pretty clear that this was going to have to be aid climbed. It looked as though the steep angle eased off after a few metres so they were hoping to free climb the second half.

Rotating her three middle-sized cams, Izzy pulled herself up the wall and reached the slightly slabby part of the rock. But, alas, the goal of free climbing died as the crack became a finger lock crack at a weird angle, with smears for feet! Not easier! She swapped her three cams for smaller ones and aided up the rest, just managing to top out just as the rain started. It was here that she learnt what the word clutch meant. They still

had no idea if they were

on the right line, or even what grade the line they did would get (she's more of an Isabel than an Isabeastabel when it comes to cracks), but never mind, they got up it!

Super exciting situation, super views, and cracking climbing (hehe). Then there were just many many awful hours of soggy descent to get through.

In the meantime, Jake and Ben had gotten ready for their big day up The Lost Marsupial on the Throne, setting off first thing in the morning to maximise their chances of summiting. Miguel and Cosima sorted out errands at camp as our bin bags had been attacked by crows again. They then set off the same way as the others to do the first three pitches of The Lost Marsupial.

By the time Miguel and Cosima arrived, Ben and Jake were still on the first pitch of the approach. After waiting in the snow, Cosima led into the moat, guided by Ben's snow footprints, and up the rock, doing an incredibly clumsy belly flop up the chimney. It was really enjoyable granite climbing with everything from a slab with an amazing hand crack, to bouldery moves onto a large ledge. Meanwhile, Jake led up what he thought was a 5.8 pitch: a striking arête with some powerful moves towards the top. Miguel and Cosima saw this same feature when they were climbing, but thought it looked incredibly difficult and was off route. Jake later realised the pitch was not 5.8 at all, nor was it part of The Lost Marsupials. It might have been E1/E2.

They quickly realised the echoes they'd attributed to rockfall were actually thunder. Looming clouds were quickly closing in around them. They decided to bail off the route despite being just short of the start of the main route. Who knew what a storm could bring all the way out here? They certainly didn't want to stick around to find out. Cosima texted Izzy and Isaac on the satellite phone that they were bailing. They decided to tie their ropes together to abseil all the way down to where they'd left their boots above the moat. They successfully abbed down to their B2 boots and started pulling down the ropes for the final abseil to the snow picket anchor. They successfully got one rope down when the other half got stuck. Miguel abbed down on the freed rope to try to pull the other down from a different angle with no luck. Ben climbed all the way back up to free the stuck rope.



Photo by Isaac Blanc

Jake chilling on the summit of Middle Troll

while Miguel and Cosima waited on the snow slope, trying to stay warm. Ben freed the rope, abseiled to Jake, and then got the other rope stuck. Ben climbed back up again a 3rd time. Amazing effort and perseverance from Ben. Whilst this was going on, the clouds closed in and they were all caught in a whiteout. Luckily by the time they had put their snow shows on and roped up, it cleared up and they walked back to base camp.



Photo by Cosima Graef

Miguel on The Lost Marsupial

Back at camp, we all made freeze dried meals and went to bed around 3am. Everyone made it back safely after a long rainy, foggy day. The Lost Marsupial remained unclimbed by 4 of us, but better home safely than an epic titled 'The Lost Imperialites'.



Photo by Benjamin Jones

Jake finding a suitable handhold on The Lost Marsupial

Day 13 – Tue 12th July

We all felt achy and tired, so dubbed today as 'Hangover Day', despite the closest thing to alcohol being our rotten bell peppers. Our basecamp was caught in a whiteout and more rain was forecast for the day. We all spent the day at our basecamp.

The weather forecast said it would rain for the rest of the week and, since planes wouldn't be able to land in a whiteout, we thought we might not be able to leave on Sunday as planned. We were reluctant to leave earlier than planned, but 5 days stuck at basecamp didn't appeal.

Day 14 – Wed 13th July

Yet another rainy day at camp. The weather forecast still predicted rain, but Thursday and Saturday offered potential weather windows to climb or leave the glacier.

THE MIDDLE TROLL EPIC AND THE LOST MARSUPIAL

Day 15 – Thu 14th July

We woke up feeling broken and unmotivated for what was probably our final climbing day on the glacier. Isaac, Jake, Izzy and Ben left for Middle Troll in the early afternoon, shortly followed by Miguel and Cosima leaving for their second attempt at The Lost Marsupial. In hopes of making a speedier ascent and faff free descent, Miguel and Cosima gave the others as much beta about Middle Troll as possible. Unfortunately, it turned into the biggest epic ever. They abseiled back down the route as a four, which took approximately 9 hours thanks to rock fall and rain.

On their second attempt, Miguel and Cosima managed to swing leads up 6 pitches on The Lost Marsupial. Except for when a big rock came loose and Cosima fell onto a rock spike (on the exact same spot that was still bruised from the South Face of Middle Troll...), their descent was flawless. On their walk back to basecamp around 2am, they could see the head torches of the others twinkling at the top of Middle Troll, illuminating it like some wild lighthouse. At least they knew all 4 of them made it to the top. Around 3am, a strong rain began but Miguel and Cosima had received no messages from the others on the satellite phone, and it was getting increasingly cold and wet.

Day 16 – Fri 15th July 2022

Cosima and Miguel barely slept from 3 to 6am. Partly because of the terrible stench in



Photo by Isabel Jones

Izzy climbing right at her limit, with characteristic style and grace

their tent, mostly because they couldn't stop thinking about what was going on, on Middle Troll, now a wet chossy slope. By 6am there was no sign from the other four. At 12pm they still weren't back. Finally, around 1pm after 24 hours on the route, Izzy, Ben, Isaac and Jake all made it back safely to basecamp, the rain still relentless. Their waterproof layers drenched through, it was not a good time to hear about what had happened. The only hint Cosima and Miguel got was noticing the yellow rope had been cut in two.

DEPARTURE

Day 17 – Sat 16th July

Today was supposed to be the only time the rain would ease for at least a few more days. We tried to call the air taxi the night before to tell them we wanted to leave, but the weather window was not workable. Cooped up in our tents as the rain kept on, the clouds rolled in, leaving us in a whiteout. Miguel checked in with Talkeetna Air Taxi about the weather every few hours but by early afternoon they had grounded all planes.

Day 18 – Sun 17th July

There was not much to remember from these days of being stuck in our tents, waiting and hoping for even the smallest of weather windows so we could leave Pika Glacier. Morale was low and visibility was worse, and the fear that at some point we'd have to eat the disgusting mac and cheese was looming over us. Dubbed as the 'Pika People' by the air taxi, we felt a sense of loyalty to the glacier that had been so welcoming to us. Yet at the same time, as long as we were awake, we couldn't help dreaming of an escape.

Day 19 – Mon 18th July

Miguel called the air taxi at 8am, 10am and 12pm. The weather was still not good enough – we were waiting for blue skies and clear visibility. We weren't optimistic until, suddenly, the sky started clearing, revealing little patches of blue. Screams of delight were heard from the Hilleberg tent. Was this it? We waited a little longer and called the air taxi. They were coming! We frantically started packing up camp but just as we were almost done, the clouds returned. Would the pilot decide to land? We saw him circle above us and then he emerged from the cloud cover and landed right next to our camp. We started ferrying our gear to the plane, the pilot (the air taxi boss himself!) shouting at us to hurry up. He was right, though, this weather window was small and if we had been stranded any longer, the air taxi company would have suggested we walk out. A 5-day walk through bear territory... We packed into the plane, feet frozen, harnesses still on from pulling the sleds, and finally let our departure sink in. As we took off, we had one final glance at Pika and the surrounding crevasse fields, before setting off into the clouds. It was beautiful and a great time to reflect on all we'd achieved on our expedition. All to the sound of Jake proudly announcing, 'I'm an aeronautical engineer' to the unimpressed pilot.

We got driven to Talkeetna Air Taxi's bunkhouse where we were allowed to stay for

free and sorted our gear to dry while taking turns to shower. These showers were positively, ground breakingly, life changing. We felt human again after 16 days without a shower.

PREPARING FOR FAIRBANKS

Day 20 – Tue 19th July

Miguel and Isaac hitchhiked to Wasilla to pick up the rental car. It was a rainy morning of errands and planning. Rain was forecast in Hatcher Pass so Izzy researched a new location.

We decided to go to Fairbanks the next day, a 5 hour drive away, to explore the climbing there.

Day 21 – Wednesday 20th July

We left for Fairbanks around lunchtime. Miguel was driving, the Hilleboys (Isaac, Ben, Jake) were cramped in the back, Cosima with a few bags in front, and some bags strapped to the roof. Izzy took the train. We arrived in Fairbanks and checked into 'Sven's campsite'. Cosima drove to the train station to pick up Izzy.

Day 22 – Thu 21st July

Miguel and Cosima made pancakes for everyone in the morning after he'd driven an old Irish woman he met at the campsite to the airport. It was a slow morning, since the others woke up a lot later than expected. We went shopping and to a hot spring for a soothing soak. On our drive back to the campsite, we were lucky to see a moose and its babies on the side of the highway.



Photo by Isaac Blanc

THE MOSQUITO CATASTROPHE

Day 23 – Fri 22nd July

We left food and gear at the campsite lockers, and drove to the public use cabin near Grapefruit Rock to drop off our things. Already, there were swarms of mosquitoes and we had to be careful not to let them follow us into the car. The moment we arrived at the parking lot for Grapefruit Rock, we knew it would be a disaster. Mosquitoes swarmed the car in huge hives like we'd never seen before. We put on as much protection in clothes as we could, hoping they wouldn't be able to bite through. Equipped with bear spray, we quickly left the car so as not to let more mosquitoes inside, and hit the trail.

At the rocks, the mosquitoes were even worse. The air was ridden with angry black swarms of mosquitoes. At any given point, mosquitoes populated our sleeves, itching to get hold of our flesh. It was impossible to climb with such swarms. We admitted defeat and walked back to the car. Driving back to the cabin, we kept finding more mosquitoes in the car. No climbing today. We made a fire outside the public use cabin to ward off mosquitoes, and played cards at the lake where dragonflies kept the mosquitoes at bay.

Day 24 – Sat 23rd July

We decided a trip to the Fairbanks Anthropology Museum would be a great way to learn more about the culture, history and geographical significance of Alaska.

Lastly, we stole a glimpse at Chris McCandless' 142 Bus, which had recently been airlifted from the Stampede Trail, for renovation and display at the museum. A few of us had read *Into the Wild*, and it was part of what drew us to Alaska.

LEARNING HOW TO BOLT

Day 25 to 28 – Sun 24th to Wed 27th July

With the weather in Hatcher Pass looking much better than before, we drove there in the morning to set up camp at Gold Mint Trailhead. After a 30 minute walk-in, we reached 'Snowbird Slab', which offered a series of single-pitch climbs. This was recommended to us by none other than Kelsey Gray, the author of the Alaska climbing guidebooks. Izzy had previously messaged Kelsey on Facebook for advice on where to go for when it was raining, and he was incredible friendly and knowledgeable. He let us know that he would be cleaning a route up there that day and to come and say hi. When he was finished, he wandered over to us. He very generously invited us to his lake-side cabin to stay during the upcoming days, in which we spent most of the time learning how to clean and bolt new routes.

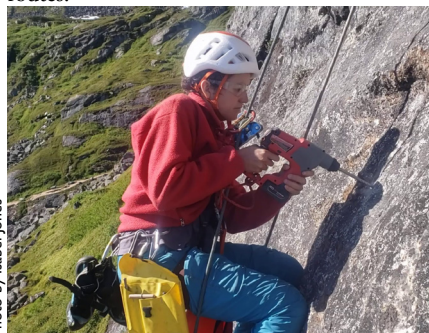


Photo by Isabel Jones

Izzy bolting

Developing a new route was not easy, despite Kelsey making it look effortless. He already secured an anchor at the top of the wall where we would be spending a few days putting up routes and first ascents, which allowed the setting up of ropes to access the rock. The first, and longest, step was to clear the moss and dirt off the rock. Starting either at the top of the route and abseiling down, or rope soloing up from the bottom, the five of us (Ben had departed in Fairbanks) set off with wire brushes and ice axes to clean the routes. The ice axes were particularly useful for clearing mud out of cracks, whereas the brushes could dust off dirt and moss.

In the end, it took around 2-3 days to clean the two new routes we were setting up, and around half a day to bolt them. After cleaning the routes, we all had a go at climbing them to see where good bolt placements would be. We marked potential spots with chalk and after adjusting and discussing them with bolt-god Kelsey, learned how to hammer, drill and bolt the hangers in place. The most exciting part was finally climbing the newly bolted

routes, which we had spent hours cleaning and bolting. Izzy, Cosima and Jake had set-up 'A Nightmare of Black Bears' graded 5.9 and 34 metres tall, whereas Miguel and another guest set-up 'Live and Learn' graded 5.10b and 35 metres tall. It was incredible to be the first people to climb these routes and we felt grateful for Kelsey's mentorship in allowing this to be possible in the first place.

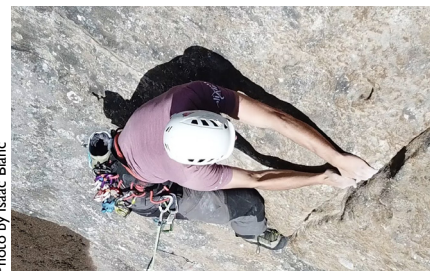


Photo by Isaac Blanc



Photo by Isaac Blanc

LAKE-CABIN BLISS

Day 29 – Thu 28th July 2022

The long summer days meant we had barely slept, always leaving the crag close to midnight and waking up early the next day to continue cleaning the rock face. We slept in and made pancakes, and spent the day relaxing in Kelsey's cabin and sunbathing by the lake. We went swimming and eventually watched the day come to an end with a mesmerising sunset. Pure bliss.

Day 30 – Fri 29th July

We went back to the same crag in Hatcher Pass for our last day of climbing with Kelsey. Miguel, Cosima and Kelsey spent the day climbing 'Power Podium', a 4-pitch route Kelsey himself had developed.

Jake finally did what he'd been attempting to do for the last week, and went bouldering, attempting 'Seasons in the Mist' V5, a classic of the area.

Izzy and Isaac embarked on the 5.10 multipitch Toto recommended by Kelsey. It had been a tiring week so they sat for at least half an hour at the base eating peanut butter and jam sandwiches while watching Jake sunbathe and play around on boulders. Ah such a simpler life down there they thought. Why were they going to do this? Should they not just go and join him... But no! They snapped out of it – it was the last day of climbing so they had to climb, and bouldering doesn't count.

The climbing was pretty stellar and went smoothly until the first of the two wide pitches. Armed with big cams from Randy, Isaac decided to lead the 5.10a 'Beastiality' offwidth pitch, so called because it feels like humping a dog. Isaac 'didn't think it looked that bad'. Izzy stared longingly at the 5.9 corner variation as he began fighting his way



Photo by Cosima Graef

Sunset over basecamp

up, soon remembering he'd never climbed an offwidth before. He made up some technique that seemed to work, but not well enough to stop him having to aid climb some of it. When Izzy followed up, she tried crimping, laybacking, and anything that didn't require being wedged into a crack. Nothing really worked, she dogged her way up and thought that was potentially the most physically challenging climb she'd done to that point, and she was on a tight top-rope. Fair play to Isaac!

This was followed by the final pitch: a physical-looking fist-sized crack up a steep corner. It was Izzy's turn to lead. Unfortunately the crack was the perfect size for her foot to get stuck. She got pretty scared because her protection was a peg and she couldn't see that she had the perfect size cam on her harness because her hip was wedged into the rock. She eventually took on the peg because her foot was acting as if it was a bomber nut that you'd need a hammer to get out. Luckily the peg held her weight, she found the good cam, and with a lot of effort, removed her foot and continued to the top. The descent was swift.

OTTERS, A BEAR AND A WATERFALL

Day 31 – Sat 30th July

After our days climbing in Hatcher Pass together, we weren't quite ready to say goodbye to Kelsey. So we made the only reasonable decision... to follow him all the way to Whittier. Whittier is a town around 60 miles

southeast of Anchorage, known for its fishing, kayaking, scuba diving and boating. We drove to Whittier to meet Kelsey at his other cabin in the early evening. Cosima, Isaac and Miguel were lucky to experience driving in Alaska, as the roads were wide, the traffic infrequent, and the views beyond beautiful. It was raining the day we arrived so everything was glistening in the light, and the waterfall next to Kelsey's cabin offered a soothing background murmur.

There was a fishing spot just a few metres down the road from the cabin, where Kelsey spent the evening teaching us. It was a picturesque little spot, where we watched a black bear catch salmon, a bald eagle soar above us, and a family of otters playing in the water.

Day 32 – Sun 31st July

Miguel and Cosima brought Isaac to the airport in the morning, bringing the group down to the final four. Izzy had caught some type of flu and unfortunately spent the day at the cabin trying to recover from her fever. Miguel and Cosima spent the afternoon observing Kelsey's impressive fishing skills.

ACKNOWLEDGEMENTS

First and foremost, a massive thank you to the Exploration board for providing us with funding, support, equipment, and a belief that our expedition would succeed. On the board, we'd like to thank Dr Lorraine Craig especially for answering any of our questions

and reading over our proposal and suggesting edits two weeks before the deadline, and also Chris Green and Ciaran McKeown. We thank the Harlington Grant and the ICMC president who applied to it, for providing us with money for equipment we needed which now belongs to the club. Thank you also to the Old Centralians Trust for supplying us with funding.

A major thank you to all the mentors the team has had over the years to teach us the necessary skills. Namely, the Jonathan Conville Memorial Trust course leaders – this is such an invaluable institution and we couldn't have done the expedition without the knowledge gained here. One such leader, Mark Walker, helped us further by being available to answer questions and give us advice when we needed it in the planning stages.

Finally, a very very large thank you to Kelsey Gray for teaching us how to bolt and clean routes, inviting us to stay at both of his beautiful cabins, teaching us how to catch, gut, and smoke salmon, and showing us the best Alaskan wilderness. He gave us a new appreciation of the effort and dedication members of the climbing community put into maintaining and developing crags purely just so that other climbers can enjoy them. We thank him also for his kindness, warmth, and company.



Photo by Cosima Graef

Aluminium

More memories from Nigel Fitzpatrick, our regular correspondent from Vancouver, about aluminium recycling, Aluminium-Air batteries, fuel-cells, and meeting a NASA legend.

Aluminium, the third most used metal, became competitive with the simultaneous discovery of an electrolytic process in France and the United States in 1886. Alcan was still being run by members of a founding family when I phoned the London office to enquire, just as the small HR team in London had started a search for a metallurgist in the Banbury works. Within a month I was racing to reduce energy consumption in the melting and casting area ("The Remelt") of the plant that had been the main source of metal for Spitfires up until 1942.

Transferred to Canada to first help start a plant and then cut oil use in response to OPEC price increases, I was assigned to recycling the "Used Beverage Can" where in five years we led the industry, despite Ontario not allowing beer in aluminium cans. I was lucky to share high fives at the 1981 start up of the first machine to feed clean cans to furnaces in Oswego NY. Improvements followed but the first success put Alcan in the lead on can recycling just as investors were concerned that aluminium growth had stalled. Alcan's new product thrust came as some countries and companies felt it prudent to cut carbon emissions. My energy savings resulted in joining CSO Hugh Wynne-Edwards to look into the technology of a portfolio of projects to develop new products as a small step in a massive transfer of research effort. Alcoa and Reynolds were on the same track and, one example, both had been contracted by the US DOE to help the Lawrence Livermore National Laboratory to put teeth on the idea that aluminium be used to fuel vehicles in a battery fed with aluminium anode. Half battery and half fuel cell, it was termed a semi fuel cell by one potential user.

William Grove had developed the first fuel cell in 1839. A couple of decades on, Jules Verne gave us the idea of the electrically powered Nautilus equipped to carry out ocean research. Would Verne envision inverters, electric motors which enable them, batteries which both enable and compete, and turbine engines which compete and support?

Are there changing strategic supply and environmental issues that impact the way we look at fossil fuel, nuclear and renewable supplies? Our technologies evolve and interact in a changing environment, and the selection we make for each market niche will change from decade to decade. As with life forms, the survival and growth of technology in one niche will mean it is available for another niche later. Conferences are great mixers and milestones. My first exposure to fuel cells was at the Alcan stand at the 1983 SAE show in Detroit. I was there, amidst a great range of aluminium automotive components, to explain the operation of a mechanically refuellable saline

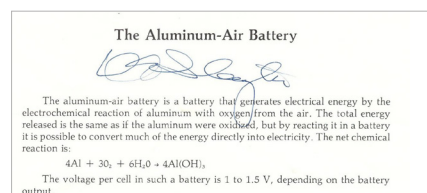
aluminium-air battery. It was powering the wheels of a 1/3rd scale model of a 1984 "Laser" loaned by Alcan's customer Chrysler. We were effectively beating the drum to get attention to the thought that lighter cars could go further with our aluminium products while Dupont were demonstrating their products just a few yards away. But our gamble was a winner for attention. A white-haired man was interested in the workings of the aluminum-air system. Deke Slayton of NASA fame told me that the cells on the stand looked a lot safer than the equipment "they give us to use". He kindly autographed the technical sheet as he spoke.

Later, when the Apollo 13 story became a movie, I realized that Deke was speaking of the safety of liquid oxygen storage for the Pratt and Whitney alkaline hydrogen fuel cells used by NASA after the Polymer electrolyte membrane (PEM) GE cells used in the Gemini program. New higher power density polymer electrolyte membrane (PEM) hydrogen fuel cells only emerged after the Apollo program. In 1990 Alcan's Alupower was able to buy a "500 watt" PEM system from Ergenics in New Jersey that was being developed; it was said to power an astronaut backpack. It needed pure hydrogen which we planned to generate from scrap aluminium. We back pedalled when we found that we needed a process, then costly, to refine the hydrogen to the grade recommended. We had stumbled on an application selecting issue. The Canadian government, meanwhile, evaluated both hydrogen fuel cells and aluminium semi fuel cells for submarines and showed that both could be used for range extension or "Air Independent Propulsion".¹ It was concluded that the hydrogen PEM fuel cell is the better solution for large underwater vehicles where neutral buoyancy allows pure hydrogen to be stored easily on board in heavy metal hydrides and safely displace the normal ballast.²

Early 2009 Ricardo Engineering concluded that a way forward for fuel cells road vehicles was as the range extender for a plug-in electric vehicle. The submarine fuel cell systems mentioned earlier have been developed in Germany, and there is now a non-nuclear option for this important domain. Type 214



Nigel and Deke Slayton discussing the Alcan exhibit at the 1983 SAE show



Nigel's prized Deke Slayton autograph

submarines had two BZM 120 kW modules connected to the ship's power system via a DC/DC converter allowing adaptation of the fuel cell power plant to different battery voltage levels. The load leveling advantage to the fuel cell is very similar to the plug-in fuel cell road vehicle or indeed the Whistler big battery bus. They differed in that the rechargeable submarine batteries are measured in MWh. One could suggest that PEM hybrid submarines would support the research needed to allow a re-emergence of fuel cells as range extenders in a world where electric vehicles are dominant even if road vehicle fuel cell work falters. The hydrogen fuel cell has succeeded beyond doubt in submarines where refueling infrastructure and hydrogen cost are not an issue and hydride can be used as ballast.³ It has leapt forward also in off road vehicles and back up power.

A disadvantage in one niche can be an advantage in another. For example, hydrides are helpful for a submarine but not for a road vehicle – so far. Are there similar cross niche windows on safety such as the stirring of oxygen tanks that compromised Deke Slayton's Apollo 13 and not the fuel cell that failed? Will a world of light electric vehicles needing intercity road range provide a significant niche for fuel cells? (They will need less hydrogen than today's fuel cell hybrids). In the mass market vehicle niche the fuel cell will compete with and complement other technologies which may enable, or displace it, depending on the dollars to reduce carbon foretold with models like GHGenius www.ghgenius.ca.

Would Jules Verne think that a climate embattled human race might look more into using the oceans as they rise and become more part of the human domain? From the progress in submarines, advancing batteries will still both enable and compete with the 'fuel cells' we select down there.

Nigel Fitzpatrick

With acknowledgements to Geoff Scamans RSM 1970 who connected us with Ray Geddes who is credited with speeding the transition to electric transmissions.

- 1 Weaver, R.G. "Air-Independent Propulsion for Submarines A Canadian Perspective" Maritech 90 Victoria, BC May 1990 with updates January 1991
- 2 Thornton, G.B., "A Design Tool for the Evaluation of Air Independent Propulsion in Submarines." MIT Thesis.
- 3 Albert E. Hammerschmidt, Fuel Cell Propulsion of Submarines Advanced Naval Propulsion Symposium 2006, October 30-31, 2006, Arlington, VA, USA

Materials for quantum technologies

In many of the recent issues of Imperial ENGINEER, our Faculty News pages have often included items about Dr Jess Wade in the Department of Materials and her work. We thought it was about time we asked Jess to tell us about herself and her research. Characteristically, she spent more time telling us about other people, but we did manage to get her to include a bit about herself.

Quantum technologies could transform all of our lives, helping us identify new drugs, develop smarter trading strategies, design more efficient solar panels, and better understand and protect planet Earth. Excited by the notion of being a world leader in quantum technology and terrified by the idea of coming second, the world's leading powers are now in a race to develop and exploit them. After Chinese scientists reported the first quantum-secure video call – a major milestone in quantum communications – the U.S. government announced the \$1.2 billion National Quantum Initiative. In March 2023, the UK government outlined the National Quantum Strategy, a ten-year, £2.5 billion commitment to fund new areas of quantum research, support the quantum sector and prepare the economy for a 'quantum revolution'.

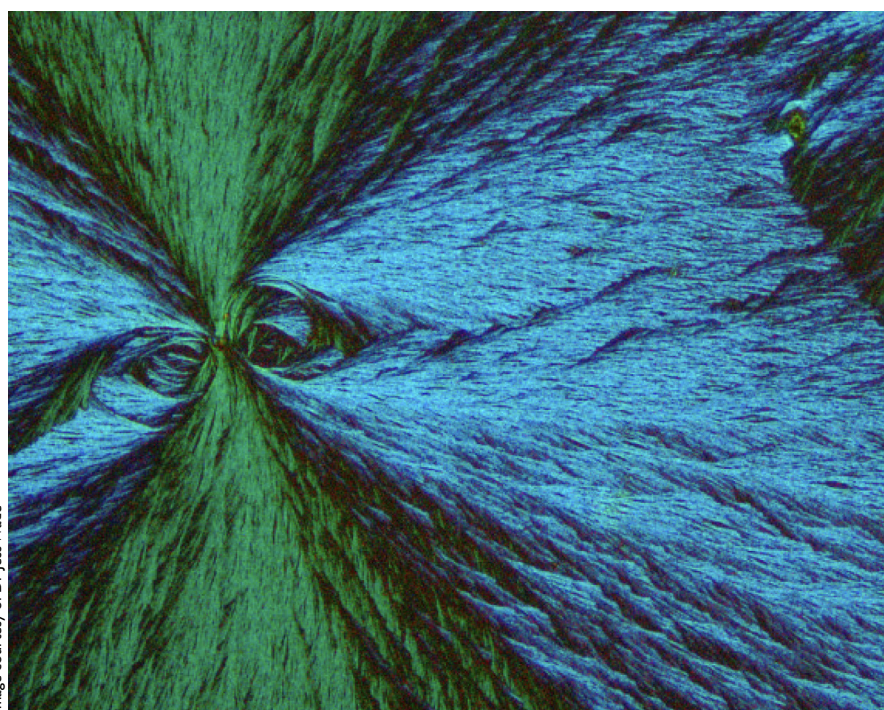
The next generation of quantum technologies will open a world of possibilities, but require several conceptual breakthroughs and considerable engineering efforts to make them a reality. At the level of individual quantum components, this involves scaling up manufacture, enhancing coherence and improving gate fidelities. At the control-level, entanglement-preserving interconnects that can bridge thermal gradients, efficient cryogenic coolers and integrated electronics are critical enablers. Alongside infrastructure to execute quantum algorithms, at the systems level, we need to develop skills, infrastructure, and standards.

Imperial are well-placed to solve the engineering challenges facing quantum technologies. Across campus, researchers are developing the software and hardware that will underpin quantum technologies. There's enthusiasm and expertise for quantum technologies at departmental level – Professor Sandrine Heutz, the new Head of the Department of Materials is actively researching molecular qubits – and at faculty level – our Provost, Ian Walmsley, is the co-founder of ORCA Computing, and Peter Haynes, Vice Provost for Education and Student Experience, is the founder of the EPSRC Materials for Quantum Network (M4QN). PsiQuantum – a quantum computing company valued at > \$3 billion – was co-founded by academics in the Department of Physics. The UK's first viable quantum-enabled accelerometer, which could be used for navigation, was developed by researchers in Physics and EEE. The 2020 Academic Strategy motivated Imperial to unite researchers from different disciplines to identify and define new frontiers in quantum

research. This led to the formation of QuEST, the Centre for Quantum Engineering Science and Technology.

Like all technologies, quantum devices rely on advanced materials – both at the core of a quantum component (e.g. the qubit) and in the supporting infrastructure – but, in general, the materials systems and fabrication techniques are far less mature than their classical counterparts. M4QN brings together the UK's materials science and quantum communities. Imperial are working on a broad range of materials for quantum applications: from 2D materials to superconductors, molecules to semiconductors to defects in diamonds. The materials challenges are far reaching; and include engineering interfaces to extend the coherence time of qubits (to increase the storage time of quantum information) and precisely implanting nitrogen vacancy defects at specific distances from the surface of diamond (to improve sensitivity to magnetic fields). Imperial combines excellent chemistry – computational screening for molecules with optimised quantum properties and complex synthesis – with well-equipped laboratories for the fabrication and characterisation of thin films and devices. Our condensed matter and materials theory researchers build computational methods to understand, design and manipulate functional properties in quantum materials.

My own research considers chiral functional materials for emerging technologies. Chirality is a property of symmetry and shape that manifests across a range of length scales in the human-made and naturally occurring world. Chiral objects exist as a pair of non-superimposable mirror images, like your left- and right-hands. Chiral molecules can absorb and emit twisted, chiral light, called circularly polarised light. Circularly polarised light can be used to encrypt information (using the handedness of the light as a new variable to encode information) and to make mobile phone and TV displays more efficient (bypassing the screen's anti-glare filters). Increasing the efficiency of all our laptop, mobile phone and TV displays could significantly reduce our global energy consumption. We've spent the last few years developing strategies to assemble chiral molecular materials in the solid state, achieving unprecedented control of photon and electron spin. Last year, my group showed it was possible to control the orientation of chiral molecules on surfaces. The supramolecular assembly of chiral molecules can create an ordered, helical electron racetrack that has strong intermolecular interactions and high charge carrier mobilities. Imperial's efforts were recognised with the 2022 Royal Society of Chemistry Stephanie L Kwolek Award, the Horizon Prize for materials chemistry.

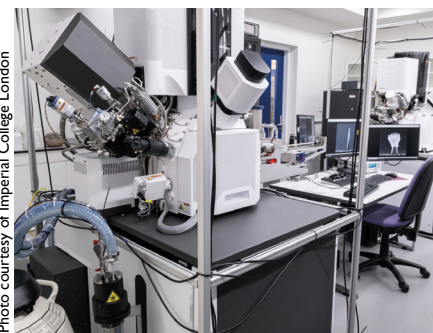


A chiral pattern under the microscope

Image courtesy of Dr Jess Wade

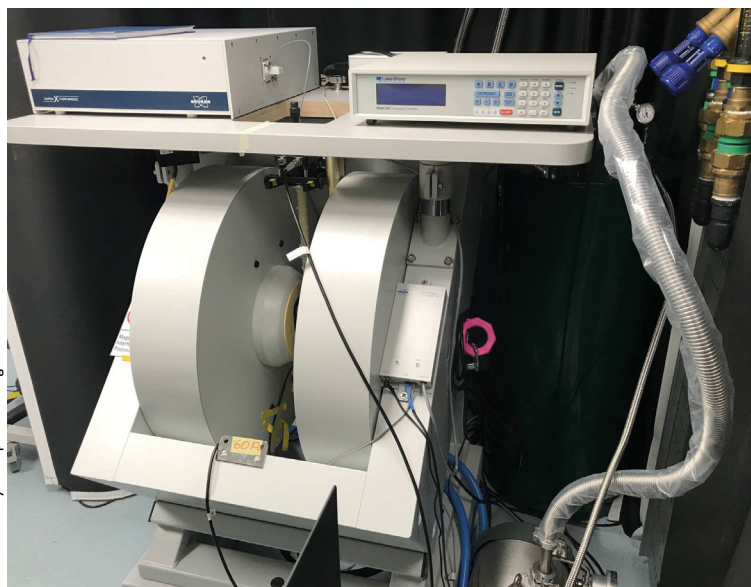
If you haven't been back on campus for a while, it's well worth a visit. Strategic equipment grants and the expansion into White City have resulted in a lot more stainless steel – think fancy microscopes and vacuum chambers – and high-power lasers. Housed deep within the basement of the RSM, the SPIN-LAB combines unique instrumentation to study isolated and coupled spins, including an ultra-sensitive magnetometer and an electron paramagnetic resonance spectrometer. Next door is the Centre for Cryo Microscopy of Materials, a £10.5M investment from EPSRC, which provides unprecedented insight into the chemical and functional properties of materials

across multiple length scales. Royce at Imperial – another £10M investment that launched this year – advances our capabilities in devices engineering, including cleanrooms, deposition and lithography systems, electronics labs, and equipment for electrical measurements. Alongside laboratories, Imperial are working on the skills development, through Centres for Doctoral Training and the development of new undergraduate modules that introduce engineers to quantum physics and its application in next-generation technologies. We're also building bridges with policy makers, made easier by our proximity to Westminster and through the Imperial Policy Forum.



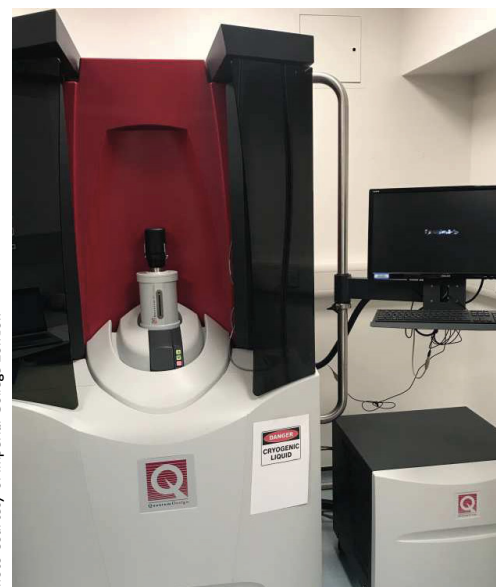
Thermofisher Scientific Helios Hydra DualBeam with cryo-stage in the Imperial Centre for Cryo Microscopy of Materials

Photo courtesy of Imperial College London



Electron Paramagnetic Resonance (EPR) spectrometer in the SPIN-Lab

Photo courtesy of Imperial College London



MPMS3 SQUID magnetometer in the SPIN-Lab

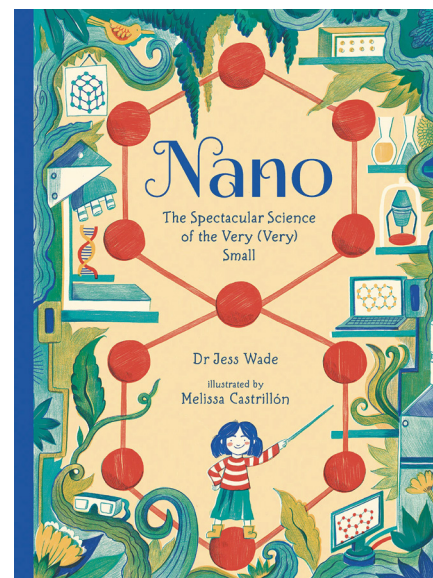
Photo courtesy of Imperial College London



Photo courtesy of Dr. Jess Wade

I'm Jess Wade – an Imperial College Research Fellow who is exceptionally proud to be based in the Department of Materials. Imperial's ability to identify game-changing trends in science and engineering, and commitment to providing undergraduates with a research-led curriculum make it an extraordinarily exciting place to work. For the last couple of years, I've been lucky enough to teach part of the nanomaterials module for third year undergraduates. Their enthusiasm, ambition and visions for an engineering-enabled fairer and more equal world are inspiring. In fact, I love the

nanoscale so much that I wrote a children's book about it (*Nano: the Spectacular Science of the Very, Very Small*), which came out with Walker Books in 2021. *Nano* has since been translated into 8 languages, received three 'starred reviews', was selected by the *Washington Post* as one of the best children's books of 2021, Awarded the 2022 UK Literary Association Prize for Information Books. I love contributing to Imperial's community engagement, too – alongside the sensational Great Exhibition Road Festival, ever since we opened the new campus at White City, we've been running family



science clubs for local residents. My most recent Saturday Science Club explored artificial intelligence and art; getting children and their parents to discuss the philosophical dilemmas AI presents.

If you studied in the Department of Materials and have since gone on to do awesome things, I'd love to hear from you... and if you're in SW7, I'd love to show you around!

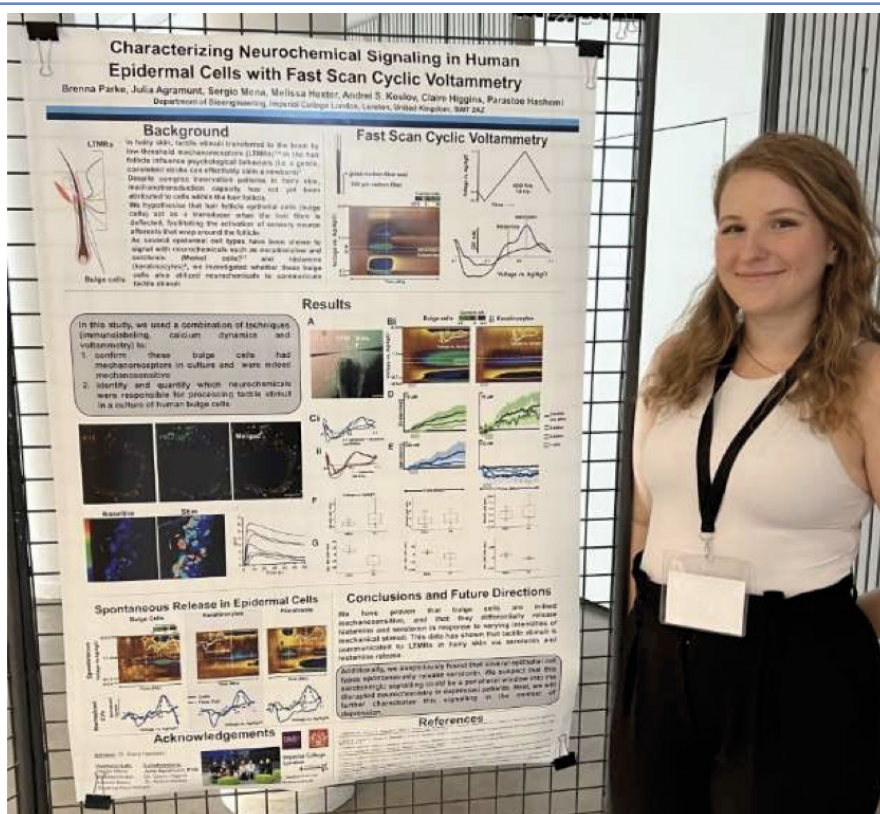
Monitoring Molecules in Neuroscience

Brenna Parke is a PhD Candidate in the Department of Bioengineering. Last summer the Old Centralians' Trust supported Brenna to attend a Neuroscience conference in Lyon, France. Here Brenna tells us about the conference and her experience.

This report details my experience at the *Monitoring Molecules in Neuroscience 2022* meeting in Lyon, France, which was made possible by the generous support of the Old Centralians' Trust. This conference was originally supposed to occur in June 2020 until COVID shut down the world, so through a lot of planning and patience, the organizers were able to pull together one of the first post-COVID in-person meetings this community has been able to attend. The immense gratitude for the organization of this meeting was vehemently expressed by each attendee, which added to the fun of the conference. The conference was moderate in size, with a little over 200 registered to attend, which was an ideal environment to foster new professional relationships. This was my first time attending the meeting, and I was excited to see many of the prominent researchers in the neurochemical measurement community to give talks in person.

The society for Monitoring Molecules in Neuroscience was established in 1982 to bring together top researchers across the world that utilize different techniques to understand neuronal signalling in the body. My research group, the Hashemi lab, is one of the leading experts in utilizing fast scan cyclic voltammetry (FSCV) at carbon fibre microelectrodes to probe in vivo serotonin and histamine signalling. Recently, we have worked to expand FSCV to probe human cells in culture, which I have worked to optimize and establish protocols in hair cells over the last year through a highly collaborative project with the Higgins lab at Imperial College. My poster (pictured to the right): "Characterizing Neurochemical Signalling in Human Epidermal Cells with Fast Scan Cyclic Voltammetry" highlighted the most important results of our study: that human hair follicle cells are mechanosensitive and co-release serotonin and histamine in response to mechanical stimulation, a novel finding in tactile signalling. During the poster sessions, I was able to communicate this exciting study to well-respected professors, students and professionals from industry. It was exciting to be able to show this community that largely utilizes rodent models, a new human model system and discuss future directions to take the project. This portion of the conference was especially beneficial for my development as a scientific communicator, as well as being able to establish meaningful professional connections based on my own work.

In addition to communicating my own research, I was able to attend amazing oral sessions at this conference, with some relating closely to my work. All of the sessions generally discussed measuring some sort of signalling in the brain, with some groups developing



Brenna with their poster "Characterizing Neurochemical Signalling in Human Epidermal Cells with Fast Scan Cyclic Voltammetry"

and expanding certain tools/methods to encompass new analytes of interest. Utilizing these tools, the researchers presented amazing strides they've made over the past decade in understanding the underlying neurochemistry of mental health disorders, neurodegenerative diseases such as Parkinson's, and even detecting spreading depolarizations from traumatic brain injury in the human brain. After several days of hearing everyone present their research, the last evening was spent at a gala dinner put on by the conference. It was a lovely experience getting to know some of

the investigators and their students in a less formal, more social setting.

This conference certainly furthered my development as a scientific communicator, inspired me to keep pursuing a career in research and helped me forge important professional connections in academia and industry.

I want to express my sincere gratitude to the Trust for funding my attendance to this conference, as it was an invaluable learning opportunity.



My group and me with our new friends from the conference

Photos courtesy of Brenna Parke

How to Engineer a Better World

Transcript of Professor Atula Abeysekera's Inaugural Lecture at Imperial College

I'm honoured to be here today talking to you. About thoughts on some key issues in the world right now. And about how engineering thinking could help fix them.

But that comes later.

First of all, some "thank you"s.

- Thanks to Faculty of Engineering at Imperial College led by Professor Nigel Brandon for so generously hosting this event.
- Thanks to Professor Washington Ochieng for Chairing this session and for his kind introduction. He's an eminent voice in systems engineering and innovation.
- Thanks to my organising team at the Department of Civil Engineering – Jeni, Tim, Lucy and Lindsey Anne.
- Thanks to Schroders who have informed and shaped my thinking over the last 13 years.
- And thanks to my students, here at Imperial, for being so full of energy, questions, and insights.
- And finally, thanks to Imperial College for being so influential and vital part of my life.

When I was asked to prepare this speech I asked "what exactly do you want from me?"

"Ah" – said the Chair, with a twinkle in his eyes – "*something trail blazing ... something that makes people think.*"

The term trail blazing originally meant marking a forest trail by blazing marks on trees. Now the Cambridge Dictionary defines it as:

Being the first to do something, in a way that is an example for other people.

So no pressure then.

Let me start by talking **about the way I think and feel**. Not just what I know and have learnt.

I am incurably curious about the world in which we live. About how, in my lifetime, things have got better.

How we are better off and live longer and fitter.

How technology has enriched us.

How we have opportunities to do even better.

And how those opportunities can be grasped.

But only if we engineer ways to do that.

I'm an optimist who believes, like Winston Churchill:

"The pessimist sees difficulty in every opportunity. The optimist sees opportunity in every difficulty."

As a problem solver you've got to be an optimist to believe anything (give or take) is possible.

Nassim Taleb author of *The Black Swan*:



The Impact of the Highly Improbable said when people's views were supported only by weak evidence, it was hard for them to change their minds.

He added:

"They have difficulty interpreting information that contradicts their opinions, even if this new information is obviously more accurate."

I like this because it underpins my own belief that too many decisions are made on the basis of ideology without referring to evidence. Evidence beats preconceptions every time.

Let's get started.

I've called this talk "*How to Engineer a Better World.*"

It is not a commercial for the Engineering profession. But I'm encouraged that engineering is getting a good press right now.

Mathew Syed wrote about the importance of engineering in the Sunday Times recently:–

"We need a new approach. And this means recruiting world-class engineers and scientists to the highest echelons of state."

I agree.

But isn't it ironic that only 27 have science degrees in the House of Commons out of 650 members?

Isn't it strange that in the top 25 countries in the world just three leaders have science or engineering degrees – two of them in Africa including Kenya.

And isn't it bizarre that in the last two centuries we've had just one science graduate as Prime Minister in the UK?

But why does engineering matter more than ever right now?

Because the essence of engineering is about creating concepts and designs. And then, planning and delivering their construction so that they really work in the real world.

It is this thinking, which underpins all engineering, that makes it so important.

This thinking-discipline of engineering is understanding how all the elements of a project interlink and how to transform a concept into a resilient system.

So my personal challenge is to make this definition of engineering thinking, or system thinking, one that's more widely understood and appreciated.

Having moved from engineering to finance I grew to understand it was engineering that had shaped my thinking, how it helped me calibrate risk and understand how to manage it.

I also learnt how engineers operating without seeking the collaboration of finance aren't really proper engineers at all.

A good example of this is the Tideway project which is one of the largest infrastructure projects currently in progress in Europe and due to be completed by 2025.

The project is being delivered by a Special Purpose Vehicle (Bazalgette Tunnel Limited) to finance, build, maintain and operate a 25km super-sewer under the Thames.

Thames Water's decision to create a separate entity to deliver the project has had an important influence on attracting debt and equity investors for this project. So far, by using engineering thinking, this project has delivered benefits right through the project's lifespan.

There are three specific **PILLARS** through which "*engineering thinking*" comes to life:–

PILLAR 1 creating better dialogues

With first, the owners of a project – the investors, those who define a business model.

With secondly, engineers who deliver the project. To the highest quality. Applying innovative cost-saving ideas and planning so as to complete on time;

And thirdly, with policy makers like Ministers or Leaders of Councils (who set the goals, regulations, and budget parameters.)

My most recent experience of the value of such dialogue was when I introduced a team from our Department of Civil Engineering to Schroders real estate team, a division of Schroders which manages 45 billion dollars globally.

Similarly, I introduced the Industry Safety Steering Group to Schroders. In both instances, I was gratified by how much common ground the engineers had with the investors.

The investors spoke openly about the value of systems thinking and the need to train leaders as to how these can shape the world in facing numerous challenges.

The elements to observe from my experience:

FEATURES

- Be absolutely categoric in agreeing and working to develop clear outcomes which meet the needs of all stakeholders.
- Develop and train leadership to adapt to unexpected risks and introduce “systems risk management” into the DNA of everyone involved in the project.
- Think how – on an individual basis – we personally apply sophisticated risk management every time we step into a car and drive. We are stepping into the unknown. Every journey is unique. Any mistake can be expensive or life changing.

PILLAR 2 – Innovation so you do things better, faster and cheaper.

The Government-funded UK Innovation Survey of 2021 concluded the goal of boosting investment in R&D to 2.4 per cent of GDP by 2027 was unlikely to happen. They said:

“R&D investment as a percentage of GDP has remained almost constant over the last two decades, increasing from 1.6 per cent in 2000 to 1.7 per cent in 2018.”

We have to change this if the UK is to become the leader in innovation that it has the potential to be.

But, we have plenty to be proud of in innovative engineering practices over the past decade.

New materials and design approaches, as well as advances in digital technology and big data, are creating a wave of innovation within the construction industry. Just some examples are self-healing concrete, 3D modelling, cloud collaborations, kinetic roads.

PILLAR 3 – Sharing Data

At Schroders, we say *“if you can't measure, you can't improve.”*

Having data provides benchmarks and shows us how to reduce risk. Data allows us to navigate. Imagine going on a long car journey without Sat Nav.

Everything we do forms our experience. It's the rigour with which this has been done which has led to flying being the safest form of travel.

Incidentally the Aerospace industry – the business of flying planes – has pioneered the creation of systems and cultures that enable organisations to learn from errors, rather than being threatened by them.

Ask to see the data. Study it. See what, if anything, needs questioning.

Engineers have always been good at sharing ideas.

The need for speed and scale in this data-rich environment has never been greater.

Engineering has never been better served.

And engineering accordingly has never served better results.

Let's move on to considering just some of the global challenges we face:–

As I see it there are three main challenges that we're currently grappling with:

1. **The Climate Change Challenge**
2. **The Population Change Issue**
3. **The Issues facing a digital world**

I'll discuss how we can use “**engineering thinking**” to engineer a better world. And more ... I'll address the opportunities offered by dialogue, education, innovation, and data.

At the end I'm going to outline specifically the opportunities for Imperial College to solve these challenges.

The First Challenge: Climate Change.

In an address to the UN on its 40th anniversary in 1989, Margaret Thatcher, then Prime Minister, said:

“Every country will be affected, and no one can opt-out. We should work... to agree worldwide ways to cope with the effects of climate.”

Roll forward 33 years and one of the biggest changes is investors' relentless appetite for sustainable and responsible investments.

In the investment community, these are called ESG where each investment opportunity is based on the systematic inclusion of environmental, social and governance factors in their financial analysis.

According to Global Sustainability Investment Alliance, direct and indirect sustainable investment in 2020 reached USD 35.3trillion.

That's amazing – it's more than a third of all assets under management by investment companies.

The world is waking up to the fact that our global economy must become not net zero but net positive.

Heatwaves and other extreme weather events are reminding us of the fragility of our natural environment.

The built environment emits close to 40% of carbon emissions. To increase funding to succeed in decarbonising requires significant investment from the Governments and effective public and private partnerships.

The natural capital, the world's stock of natural resources, which includes forestry and other land use, contributes 22% of global emissions, half of which is caused by deforestation and land conversion.

So how can we accelerate the progress towards net zero?

First action – By speeding up the planning regime.

As we all know initiatives usually take too long to happen.

Yet (for instance) the performance and speed of the UK's vaccination programme, showed how this could be changed by

collaboration and the will to speed up in the face of a catastrophe.

A key place to apply better systems thinking is in our cities – that's where half of the world's population live. We need to promote planning with better spaces, taking account of human well-being.

And we need to build resilient cities able to withstand shocks like extreme weather.

Frighteningly, 25% of the world's port cities are at risk of severe coastal flooding. This would affect over 250 million people.

Next action: Improving collaboration.

How? Through effective dialogue amongst stakeholders.

This requires an outcome-based system approach to delivering on major infrastructure projects. A set of common language amongst all stakeholders – investors, engineers, and policy makers so they'll all better understand the common goals.

We also need to have a financing structure so that Global South is not left behind by Global North.

And next by obtaining good data.

We've made good progress in measuring carbon using proprietary models and sources from data providers. Carbon disclosure in annual company reports has been an effective innovation too.

However, we don't yet have a widely accepted quantification methodology to measure investment benefits from Natural Capital.

Not yet...

The Second Challenge: Population Change.

When we talk about population change, the focus is often on the ageing population, their needs, health, well-being and living spaces.

What gets less attention is the decline in the total global fertility rate. According to the United Nations, global fertility rates are in general decline.

This trend is most pronounced in industrialised countries, especially the USA and Western Europe, where indigenous populations are projected to decline dramatically over the next 50 years.

Today, two-thirds of the global population live in a country where the fertility is below 2.1 births per woman – that's roughly the level required for zero growth in the long run for a population with low mortality.

But beware. The assessment of demographic change is global, the politics of demography can – of course – be very local to individual countries.

For instance, according to the UN, the 46 least developed areas are among the world's fastest-growing populations. Many are projected to double in population by 2050, posing significant pressure on the UN

sustainable development goals.

So overall the population birth rate is falling steeply. It peaked half a century ago, reaching a high of 2.1 percent in the 1960s. Since then, it has been halved to just over one percent per year.

During the lockdown, statisticians predicted a surge in the birth rate. In fact, the reverse happened.

With this backdrop, how do we use engineering thinking skills to face this challenge?

In the UK the big number is this. The number of over-65-year-olds is growing rapidly and by the middle of the century will be the same as the number of under-25-year-olds.

We have no independent body like the Office of Budget Responsibility to study this.

If an **Office of Demographic Change** were created, it could assess the impact on the built environment and how much investment is needed to bring it up to date to required standards.

The need to reconcile declining birth rates with increasing longevity of life will lead to a huge economic challenge. And we need to face up to it.

The Final Challenge: what we face in a world more reliant on AI

The digital revolution is still in its infancy, but technology has already transformed our lives, mostly for the better.

The new wave of technologies based on artificial intelligence, machine learning, robotics, virtual reality, and health data will profoundly impact our lives even more strongly.

Data and digital technology will be part of the answer to increasing better solutions to the wider population, especially those who live in cities.

Intelligent and proprietary models may create digital divides in the name of competitive advantage, but I strongly believe better dialogue – to share these – would leapfrog innovation and create benefits from existing and new technology.

To the wider public, building autonomous cars and robots may help day-to-day life.

But these are only just the beginning.

Many more life-enhancing innovations are on the way. These will bring great opportunities but will introduce new risks.

The European Commission is proposing a first global legal framework for Artificial Intelligence to ensure fundamental rights of people and businesses are protected when developing AI.

They propose introducing risk-based metrics to guide developers in developing artificial intelligence tools.

Incidentally – in passing – I want to talk briefly about Ai-Da.

Ai-Da is the world's first ultra-realistic artist robot. She draws and paints using cameras

in her eyes, her AI algorithms, and her robotic arm. She was presented to the Lord's Commission for Communications and Digital development in October.

The best thing? She went to sleep (that is "she turned off") when it got boring. A lesson to all politicians.

The reality is this.

Technology alone will not change our lives.

It's how we use technology and focus on its useful development that will.

Max Tegmark is the author of **Life Three Point Zero**.

He's a Swedish-American physicist, cosmologist, machine learning researcher and Professor at the MIT.

In it he says AI progress has the potential to improve our lives in many ways, but warns those who **think AI is taking over**:

"There's absolutely no guarantee that we'll manage to build human-level Artificial General Intelligence in our lifetime....or ever."

So how can Imperial College help address all these challenges?

Well, like Martin Luther King I have a dream.

Department of Civil Engineering at Imperial College was ranked No1 by the *Guardian* Best Universities Guide and *Sunday Times* Good University Guide. Arguably it has the best engineering faculty in the world.

My dream is that Imperial College Faculty of Engineering (possibly in collaboration with the Royal Academy of Engineering) kick start the creation of an annual forum and an exhibition of high-level thinking involving senior thinkers from those three key strategic pillars – Finance, Engineering and Policy Makers.

This problem-solving group's deliberations, if we pull this together in the way I hope we do, will be widely reported, widely respected and widely influential. I'm thinking of Davos for engineering but with much more intellectual power.

If we manage to establish this, "Engineering Thinking" will become more widely used and understood. More importantly this cross functional group of thinkers will set a new trend for collaborative working.

So that is my dream. A tangible innovative initiative. Led by Imperial.

Finally, here are some thoughts on how we can personally improve our own thinking and help engineer a better world.

1. Think small.

Think in manageable chunks, break problems down into small segments. Thinking small step-by-step can lead to effective solutions to apparently insoluble problems.

2. Think velocity.

We are living in a fast moving, integrated world. And it's moving faster.

If we can't keep up with it we shall fail.

3. Think about resilience.

It's a fact that human bones get stronger when subjected to stress and tension. We need to build greater resilience into our infrastructure.

4. Think radical.

People are prone to talking about normal... in this current world they say "**when things get back to normal...**"

Radical is the new normal. We can't just move at yesterday's pace.

5. Think ambitiously

The biggest risk is not taking any risk. In a world that is changing quickly, not taking risks to achieve change and performance improvement is a strategy doomed to fail.

6. Think individual then local then national and only then global.

Build your thinking from the bottom up. Just thinking about the big picture can distract us from the most important thing: **People.**

How they think, feel and behave.

It's people with their annoying habits, wonderful imaginations and talents, not algorithms, who drive our world.

And remember the key is learning how to collaborate, not just compete.

Time after time the **smartest people claim engineering** is the real engine of change...

I agree.

So I want to conclude with a thought that makes me think and makes me laugh.

"To the optimist, the glass is half full. To the pessimist, the glass is half empty. To the engineer, the glass is in need of complete redesign."

Thank you.

Professor Atula Abeysekera is the first Professor of Practice in the Department of Civil Engineering's 144-year history. A graduate of the department, he has over 30 years of commercial experience at civil engineering and blue-chip financial institutions and is the immediate past president of CGCA.

STEMulator – an update

In IE34 (Spring 2021), Richard Gundersen (Elec Eng 1973-76) introduced us to the STEMulator, an online initiative of professional STEM societies in South Africa that he instigated, designed to stimulate interest in STEM among young people, in order to ensure a youthful pipeline of STEM practitioners and professionals. Two years on, we have an update on progress and a call for suitable material from Imperial Alumni to include in the freely available content.

The STEMulator project continues to expand and invites alumni and interested parties to submit educational animations and labelled diagrams to enrich this virtual XplorITory.

The STEMulator provides a detailed landscape with entry points to click through to a wealth of information. Conceived as a modern 'how-does-it-work?', the STEMulator is designed to both stimulate and satisfy a curiosity

in the STEM (Science, Technology, Engineering and Mathematics) world and careers.

The initiative of an old Centralian and a few other like-minded colleagues, this is professional payback time. Initially funded from an available trust fund, the STEMulator is freely available at stemulator.org. Targeted at school children to open their eyes to the enormous range of scientific and engineering careers and hopefully

regain the flow of students into STEM courses in tertiary education.

The valuable rôle that our alumni can play is to share educational video clips that can be curated in the STEMulator, similar to the methodology that created Wikipedia. The landscape already includes a car, a plane, power stations, a human being, a hospital, a farm, a nature 'tile', a construction site, a satellite and a house, with plenty of scope for additional layers of detail.

Recent additions to the STEMulator are a factory, a museum and science plaza, also hungry for content. Currently under construction are a transport section and a mine.

If you are involved in any of these fields, please consider volunteering some material to help flesh out the skeleton.

>Science
>Technology
>Engineering
>Mathematics

STEMulator.org
from childhood to career

>Explore
>Discover
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click and reveal

Explore STEMulator's virtual landscape – for an inside view of all things STEM
Full of animated content – Free, on-line, interactive and digital
An initiative of NSTF/proSET professional societies, for the next STEM generation
Memory-stick versions available for remote and rural areas

info@stemulator.org | www.stemulator.org | follow us on social media



£250,000 donation to support students in the Department of Earth Science and Engineering

A generous gift from a Royal School of Mines alumnus will create bursaries for students from disadvantaged backgrounds and establish a new student prize.

A donation of £250,000, made anonymously by an alumnus of the Department of Earth Science and Engineering, has established the Rocky Fund, a new source of funding for the Department which will create bursaries for undergraduate students in financial need and a prize for outstanding undergraduate students.

As an endowed gift, this donation will fund the prize and bursaries in perpetuity, supporting generations of deserving students from all backgrounds to study geosciences and to thrive during their time at Imperial.

Bursaries to extend opportunity

The Rocky Fund will provide one bursary every year to an undergraduate student who demonstrates exceptional academic potential, but who might otherwise struggle to finance an Imperial education. The first bursary will be awarded in 2023 to a student starting their studies in October.

Bursaries provide students from lower-income backgrounds with additional financial support and, unlike a loan, do not need to be repaid. For many students

from disadvantaged backgrounds, receiving a bursary means they can focus on their studies, rather than worrying about money or having to work alongside their course.

This donation will support the Department of Earth Science and Engineering's work to encourage applications from students from backgrounds which are underrepresented in the Department and to improve diversity in the fields of geology, geophysics and earth and planetary science.

Rewarding academic excellence

The donation will also establish a new prize which will recognise outstanding academic performance. The prize will be awarded annually, beginning in the academic year 2023-24, and will be open to undergraduate students on any Earth Science and Engineering course.

The prize aims to nurture academic talent and provide awardees with the funds to further themselves as earth scientists and engineers, whether that means developing their own innovation or business, continuing their studies at Imperial or at other institutions, or financing research or field trips abroad.

Professor Tina van de Fliedert, Head of the Department of Earth Science and Engineering said:

"We are so grateful for this generous donation, which will help to remove economic barriers that might prevent young people from considering a career in geoscience. Bright young minds from all backgrounds are vital in our community of problem solvers to tackle the challenge of climate change and to transition to a zero-carbon and zero-pollution society."

Philanthropic support of this kind not only makes a difference for the next generation of geoscientists and engineers but will also enrich and advance industry and academia by making it more diverse and inclusive.

Thanks to the vision and generosity of our alumnus donor, we can attract the best and brightest students, from all financial backgrounds, to choose to study Earth Science and Engineering subjects at Imperial, not just now, but long into the future."

The Royal School of Mines Association (RSMA) has been closely involved in establishing the new bursary and prize and is leading ongoing fundraising efforts aimed at increasing the Rocky Fund and extending the support the fund offers young engineers.

About the Department of Earth Science and Engineering

Part of the Royal School of Mines, the Department of Earth Science

and Engineering is home to around 500 undergraduate and postgraduate students.

Undergraduate students take courses in Earth and Planetary Science, Geology and Geophysics, and postgraduate students pursue courses in Applied Computational Science and Engineering, Environmental Data Science and Machine Learning, Geo-Energy with Machine Learning and Data Science, and Metals and Energy Finance.

The Department's pure, applied and engineering research is at the cutting edge of discovering how Earth and planetary systems work, and how natural resources and energy can be sustainably extracted and utilised during the energy transition and towards a zero-carbon and zero pollution future.

The department is committed to its diverse community and promotes inclusive and collaborative research and teaching for the benefit of society.

The RSMA was very pleased to be the conduit for this incredibly generous donation and has been asked to be a part of the selection committee of both the Rocky Bursary and Rocky Prize. If you are interested in supporting the Rocky Fund or wish to receive more information about how you can support RSM students then please let us know on rsma@imperial.ac.uk

ESE and MSE alumni join RSMA and RSMU for the annual Careers Evening

On February 6th, 2023, the Royal School of Mines Union held its annual Careers Evening in collaboration with the Royal School of Mines Association (RSMA). This event provided an excellent opportunity for approximately 30 current students to learn about life after graduation from the RSM, as the invited speakers were RSM Alumni from either the ESE or MSE departments, at both the undergraduate and postgraduate levels. This year, eight speakers from various backgrounds, including offshore energy, security consultancy, application science, catastrophe modelling and climate change/natural hazard risk studies, space operations, and postdoctoral research, each gave 15-minute talks about their journey in the industry. Their presentations covered topics such as how they chose their career path, what a typical day at their job entails, the advantages and disadvantages of their work, how they use their university-acquired skills, and the knowledge gained from their degree to complement their current roles. Additionally, they provided some application tips and tricks and informed students

about emerging industries and other areas to explore for their careers.

Although each speaker's talk was unique, they all emphasised the importance of being open-

minded and flexible, taking risks, and stepping out of one's comfort zone. All speakers touched on a common theme in that gaining an education at RSM set them up to be able to survive in the work place. This was due to the variety of learning techniques, presentations, seminars and social activities that they were exposed to in their university career.

RSMA President Tim Cotton and RSMA Honorary Secretary Chris Webborn were also present to talk about the RSMA's activities and how the RSMA can provide life-long benefits to the students of the RSM. Attendees had multiple opportunities to network with the speakers and other RSMA members to gain more first-hand information and ask questions. The RSMA provided refreshments at the break, ending the evening in the Union Bar.

Overall, everyone agreed the evening was a great success, with the speakers sharing valuable wisdom, career advice, and reminiscing about their time as RSM students.

Finally, the RSMA would like to acknowledge the efforts of Reha Chandresh (RSMU Honorary Secretary) for all her hard work in setting up an excellent evening.



Photo courtesy of Reha Chandresh



Photo courtesy of Tim Cotton

Alumna wins Arts Foundation 2023 Futures Award

Louise Skajem, an alumna of the Dyson School of Design Engineering, who graduated from Imperial and Royal College of Art's MA/MSc Global Innovation Design in 2022, won the £10,000 Arts Foundation Futures Fellowship Award for Bio Design. Her work uses material exploration and biomimicry to design innovations that tackle climate change.

The Bio Design Award champions designers working with biomaterials and who are striving to accelerate our transition away from extractive and carbon-centric design and materials. The award supports ambitious practices and design innovations that work towards symbiosis with nature.

The winners were revealed at an award ceremony in February, presented in partnership with *Leeds 2023: Year of Culture*, featuring a special welcome address from British visual artist, Claudette Johnson MBE.

Presenting the award was Sarah Wigglesworth, Founder of Sarah Wigglesworth Architects, who said: "All of the designers showed huge commitment and purpose in their research which is changing our response to the natural world. Often starting with a natural product or condition, these designers seek



Photo by Aura Murillo

new uses and applications for these self-generating resources that could mean we touch the planet more lightly.

"The winning Fellow, Louise Lenborg Skajem stood out for the quality of her practice and original ideas, which have a practical application to a societal issue. While being visionary, one of her projects, 'Resting Reef' was also eminently realisable and a beautiful solution that regenerates ecologies. It was also superbly communicated."

Louise said: "There are so many talented people working in this field, so I was very honoured to be shortlisted in the first place. I am still processing the fact that I won the Award and how this changes a

lot for me going forward."

She added: "I will now be able to dedicate my full time to Resting Reef, a project Aura Murillo and I started during our masters at Imperial and the Royal College of Art. This award will also allow me to move my experiments out of my kitchen and find a suitable studio space, which I am very excited about."

Louise's creative journey started after she completed a foundation year in Paris, graduated with a BA in Design from Goldsmiths University and a MA/MSc in Global Innovation Design at The Royal College of Art and Imperial College London, and co-founded two companies. As a designer, Louise enjoys mixing scientific research and innovative thinking to create novel sustainable ideas for the real world.

Louise's most recent project, Resting Reef – launched with fellow Imperial alumna Aura Murillo – is an eco-burial service that uses crushed

oyster shells and bone ash to build reef structures that enhance marine growth. The UK funeral services industry in the UK is estimated to be worth nearly £3 billion, and the average cost of dying in the UK is £9,200. Resting Reef aims to redirect this money away from polluting, outdated practices towards impactful restoration projects while providing meaningful legacies. The project is currently in a start-up development phase, with plans to launch its first product in 2023.

The annual Arts Foundation Futures Awards support the UK's most promising artists and creatives at a pivotal moment in their career, providing £65,000 in unconditional grant funding, awarding five transformative £10,000 Fellowships, with all shortlisted artists receiving £1,000 towards the development of their practice.

<https://bit.ly/IE38-ArtsAward>

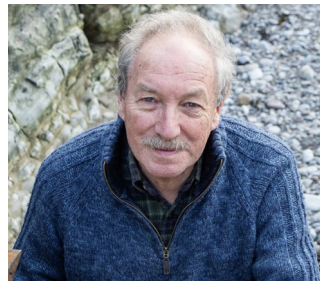


Photo courtesy of Resting Reef

Resting Reef using crushed oyster shells and bone ash to build reef structures that enhance marine growth.

Winners of the 2023 Imperial Alumni Awards

Now in its fourth year, Imperial's Alumni Awards programme celebrates the outstanding achievements of Imperial graduates, acknowledging role models and thought-leaders within the alumni community and shining a light on the contributions of Imperial alumni to science, engineering, medicine, business and society across three award categories.



Professor Sir Stephen Sparks (Geology 1971, PhD 1974) is the winner of the Distinguished Alumni Award, which honours alumni who have demonstrated sustained excellence in their personal and professional achievements, are leaders in their field or have made a substantial impact on society.

Stephen's childhood hobby of picking up fossils and collecting rocks was just the beginning of a lifelong interest that would take

him across the world and spark an illustrious career. A highly respected volcanologist, his work has significantly advanced the fundamental science in this area. After graduating from Imperial, Stephen held an 1851 Fellowship at Lancaster University before moving to the US to work at the Graduate School of Oceanography. Returning to the UK, he became a lecturer in the Department of Earth Sciences at the University of Cambridge before joining the Department of Geology at the University of Bristol, building a world-class department.

Stephen has also helped develop hazard and risk assessment methods used around the world. As a founding director of the Montserrat Volcano Observatory and chair of the science advisory group, he was able to inform decision-making on safety management, evacuations and long-term planning during the 1997 eruption, avoiding the need for an island-wide evacuation.

Among other prestigious awards, Stephen won the Vetlesen Prize in 2015, widely regarded as equivalent to a Nobel prize for earth sciences. He received a CBE in 2010 for services to environmental science and a knighthood in 2018 for services to volcano science and geology.

Despite retiring in 2020, Stephen continues to carry out research, share his knowledge and collaborate with others, recently working with University of West Indies colleagues on a new eruption on the island of St Vincent.



Photos courtesy of Imperial College London

As the founder of Aurora Solar, **Christopher Hopper** (MEng EEE 2011), winner of the Alumni Entrepreneur Award, is working to solve one of the biggest problems facing the planet: clean energy for a sustainable future.

Aurora Solar, who develop AI-powered software for solar panel installations and are trusted by 90% of the top US residential solar contractors, are now valued at over \$4 billion.

Christopher didn't set out to become an entrepreneur but is thriving in the role. As CEO he

relishes getting to talk about finance, people, products, business strategy: "It gives the biggest possible view into the organisation that I love."

When asked about his motivations and his plans for the future, Christopher has a clear vision:

"In the end, it's simply something I believe in and it's not something I can put aside. I fundamentally believe the world is better off powered by abundant, cheap, clean energy and I think that's a future worth fighting for. There were plenty of challenges along the way – and there will be more – but it's that conviction that keeps me going."

Five alumni have been recognised with the Emerging Alumni Leader Award, which celebrates graduates from the last 15 years who are inspiring role models, mentors or champions for equality and are making an impact on society: **Dr Amina Al-Yassin** (MBBS Medicine 2011), **Dr Brian Wang** (PhD Medicine 2019, MBBS 2021), **Dr Clementine Chambon** (PhD Chemical Engineering 2017), **Dr Christiana Udoh** (MSc Chemical Engineering 2014, PhD 2018), **Erbilin Ribari** (MSc Investment & Wealth Management 2019).

<https://bit.ly/IE38-AlumniAwards>

54th Triode meeting – 6th January 2023

Three strikes but not out!

This time it wasn't Covid that stopped us meeting but rail and bus strikes! It was the third time we had to revert to Plan B and use Zoom for our reunion. We started earlier so that overseas Triodes could join us and we had 18 Triodes on our call (see picture). Many thanks to Richard Lewis who set up a Zoom meeting for us. We had participants from Germany, Poland and Australia and probably had more Triodes than a physical meeting – but read on.

Everyone gave an update, see below, and Steve Glenn had invested in a sophisticated timer to make sure that speakers didn't stray over their allotted two minutes. That made the meeting flow much better and it lasted around an hour and a half, about half as long as last time!

The common themes seemed to be vortexes, electric cars, and that most of us were still working (though not all were being paid) either with jobs or with grandchildren! One subject that we were unanimous on was moving the date for the yearly Triode meeting so read below for more information.

Important news about the next two Triode Reunions – 2023 & 2024

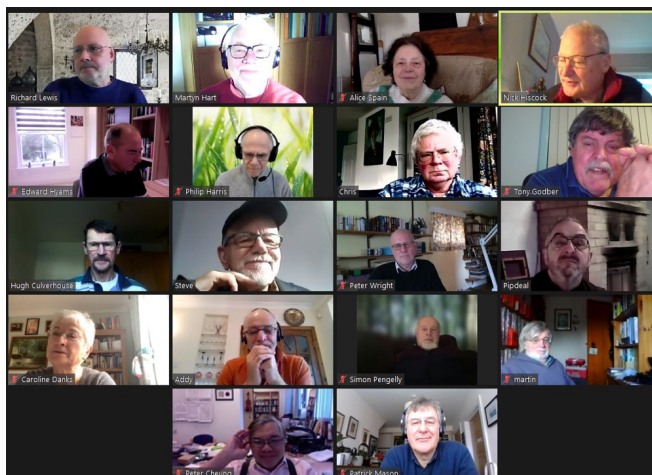
2023 is important to us and Imperial College as it is our 50th year since graduation! Imperial will host a 50th Decade Lunch on the 25th November 2023 and we are all invited. So, please make sure you have that date in your diary!

We decided that it would be good to meet up in person this year and also that the first Friday in January wasn't as appropriate now as it was when we were all working. So, we plan to move that reunion to a Saturday lunchtime in the middle of May when the days are longer and the weather is warmer.

To test our theory that May is better, we are going to hold an extra Triode reunion this year on Saturday 20th May 2023, which will be our 55th Triode reunion! We will meet at the Eastside bar (where Linstead Hall used to be) at 12:00. It would be great to see as many Triodes as possible so please put it in your diary. After a few drinks we will make our way to a restaurant and, as Peter Cheung will book one in advance, it would be useful if you could let me and Peter know if you can make it.

Assuming that this test is successful, 2024's reunion will not be held in January but will be on Saturday 18th May 2024, around 12:00 and probably again at Imperial College. This will be our 57th reunion! Put it in your diary now.

Have a great 2023.



1st (top) row, L to R: Richard Lewis, Martyn Hart, Alice Spain, Nick Hiscock; 2nd row: Eddie Hyams, Philip Harris, Chris Giles, Tony Godber; 3rd row: Hugh Culverhouse, Steve Glenn, Peter Wright, Jorge Gabrielczyk; 4th row: Caroline Danks, Addy Adesara, Simon Pengelly, Martin Clemow; 5th row: Peter Cheung, Pat Mason.

Of those who Zoomed in on the 6th January (there were 18 of us!):

Addy Adesara

Addy reports that he and his wife (of 40 years) Sheela now both work in telecoms. Sheela works for O2 while Addy works for Vodafone which, as you can imagine, leads to some interesting discussions! They have holidays planned for 2023 in Asia in February and South America in the autumn. Both their girls remain working as GPs but at present they are single so no grandparent duties yet for him. Both Addy and Sheela plan to come to our decade reunion in November. Addy has had two hip operations but he is still playing hockey (though according to Sheela it's just an excuse for a few beers!).

Alice Spain

Alice says that she finally had her holiday on the Orient Express from London to Venice. It was third time lucky, although it was fifth time lucky for some of the other travellers. What an experience. While she was there, she went to the Murano glass factory and bought a chandelier. It now hangs in her dining room and looks wonderful, especially when the sunlight hits it. Work on her house stalled after Covid hit but work on the garden continued and it's almost finished. She hosted a charity fun dog show in June and about a hundred dogs and their owners came along for some fun. It was great to be able to support Help4Heroes too. She remains the London Walks organiser for the City & Guilds Association and welcomes all triodes on her walks.

Caroline Danks

Via some work by Imperial College and a letter from Steve we have found Caroline Payne, now Danks. She says that after graduating from IC in 1973 she married Tony Danks, an IC Physics graduate. She joined the MoD as a Graduate Engineer, training first at the Royal Aircraft Establishment in Farnborough and then working in the Procurement Executive in London for several years. She took a career break of nearly 10 years to have three children and returned to work at Farnborough in 1989. In 2001 the MoD privatised the R&D Establishments and Caroline became a Trustee of the pension scheme for the new company QinetiQ. She says that she was fortunate to get early retirement in 2006 and has since trained in various alternative therapies. Now she is a Life Alignment practitioner and the longest serving Trustee of the QinetiQ pension scheme. Life is very busy!

Chris Giles

When Chris isn't still designing systems for handling aviation fuel, he is either active in the renaissance of analogue computing or is rebuilding a derelict cottage!

Eddie Hyams

Eddie was another find via Imperial College and a letter from Steve! He tells us that, up to year 2000, he was working with Southern Electric becoming Engineering Director then MD at Eastern Group plc after it was acquired by Hanson Group. Subsequently he's taken an entrepreneurial and environmental focus, including being

one of the founding partners of a European renewable energy PE fund and leading the first professional financing of renewable assets in the UK. He was Chairman of the Energy Saving Trust and latterly has been directing a serious focus on the expansion of renewables in the UK and on EVs. He is also a supporter of the Lymphoma Action cancer charity and on its development board.

Hugh Culverhouse PLY

After 2 years of only seeing his family in England and USA by Zoom, Hugh says he was finally able to get out travelling again. He had five trips from his home in Munich to England in 2022 and one trip to the USA to see his sister and family in Boston. In spite of the new freedom he did not have a proper holiday in the sun but he did manage to get to Venice (a train trip from Munich) for three days. In the Spring he sadly had to recognise that his artificial hip (the second) was again loose and needed further surgery, which for various reasons would be a real challenge for the medical profession. They wanted to do it in 2022 but, as his day-to-day life is not so affected (he uses sticks anyway), he decided to wait until 2023. In the meantime, Hugh keeps on pedalling those one-legged bikes, without much objection from the ailing hip, and reached 10,000 km for the year 2022. Stop press – he is now titled Hugh Culverhouse PLY ('Paralympian').

George (Jorge) Gabrielczyk

George told us that during the year he has moved on with the rebuild of the manor but there is still much to do. He now has a fully equipped carpenter's workshop and the captive carpenter (who is not much younger than George) is busy making the furniture and panelling for the hall, library, and estate office. He has already made most of the doors and associated panel work for the entire manor and also one set of stairs. They are making everything from European forest oak, which is both difficult to get and expensive when you can get it, so they have to buy logs and then saw and season the material themselves. Anyhow, the empirical results of George's years of restoration work on the manor allow him to state (with the authority born of many years of experience and without any reservation) that alcohol is the best preservative known to man.

Martin Clemow

Martin reports that he is well into enjoying retirement, though he is working, especially on restoring and renovating classic cars. Plus, of

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course, helping his children, friends and neighbours with electrics, DIY and even plumbing! Luckily the house in France has been sold which means he can spend more time in Somerset enjoying the lovely countryside all around him.

Nick Hiscock

Nick found this year challenging following Sue's unexpected death in December 2021. In July the Coroner decided her death was due to natural causes which allowed Nick to finalise things, much of the year having been spent sorting the estate and migrating his house into a bachelor pad. On the more positive side, daughter Pippa gave birth to Edward in February (Nick is certain he will become an engineer) and in October daughter Jenny was promoted to Professor of Chemistry at the University of Kent and also won the staff Inspirational Leader award and the prestigious Royal Society of Chemistry lectureship for 2022. Nick supported Jenny at some of the UK battle proms this year, where Jenny now rides in the Napoleonic cavalry but increasingly without a bridle!

Patrick Mason

Pat told us that this year he hit 70 and celebrated with a flight over Kent and Sussex in a Spitfire based at Biggin Hill. He says it was incredibly moving as he flew over his village (Mayfield) where his father had been based briefly in June 1940, as his unit prepared underground guerrilla hide-outs/arms dumps in readiness for the expected invasion after Dunkerque. He told many stories of watching dog-fights overhead during that time, so to fly over the village, pretend 'strafing' some friend's homes (!), was both amazing and a great way of paying homage to the memory of his father (and indeed all our parents' generation). Pat had a great pilot who let him have the controls for over 15 minutes – such an easy plane to fly, so responsive and that amazing sound of the Merlin. He was thankful that it all went smoothly as, although he did have a parachute and was trained in how to bail out if required, he wasn't very confident that it could be done quickly enough to make any difference!

Peter Cheung

Peter continued to be Head of the Dyson School through 2022 but he is going to step down at the end of July 2023. After that, he will continue at 60% capacity with both Design Engineering and Electrical Engineering as a professor (at 30% each) for at least the next five years. The past year saw Peter's second daughter graduating her PhD and getting engaged. Also, since the start

of COVID, he and his wife welcomed their second granddaughter. He continues his boring life of teaching and research at Imperial for the foreseeable future.

Peter Wright

Peter said that, on the family front, his daughter is now senior counsel (specialising in Fin Tech Regulation) in a global law firm and has moved to the Caribbean (BVI), to be nearer her boyfriend. His son is still with an organisation in Cheltenham. This year Peter and his wife had one holiday in the Isle of Arran – they walked Goat Fell, drank lots of whisky and attended one funeral (Uncle: 101, D-Day veteran and Légion d'honneur). He is now playing with Raspberry Pi – Pico W and embedding temperature sensors around the house pending a decision to switch from Crittall (70-year-old steel) windows to double glazing. He is still thinking about heat pumps and he is still with the Scouts, helping them with proposals to redevelop the movement – mainly make it more welcoming to volunteers.

Phil Harris

Phil reports that he and his wife, Lina, had a busy year playing 'catch-up after Covid' with holidays around the UK and Italy and making day visits to places. Unfortunately, Covid did catch up with them in September – just in time to delay their autumn booster vaccination! Phil recovered fairly quickly but Lina was poorly for quite a while. On the technical front, he has been battling an intermittent fault in an old Windows XP PC for a friend. As ever, he says, you learn a lot when something doesn't work but he couldn't fix it and his friend has now bought a replacement on eBay. Phil will continue his learning curve by installing his friend's legacy software on the replacement!

Richard Lewis

Richard and his wife, Eleanor, made several trips to France over 2022. In January they drove non-stop to their house in the eastern Pyrenees because, under French Covid regulations, they were not allowed to stop. On arrival they had Covid tests (both negative) before they were allowed out and about. Unlike in the UK, the police turned up on the doorstep a couple of days later to check their Covid status was negative. In March Richard had a big family lunch near Tower Bridge to celebrate his 70th, followed a couple of weeks later by a skiing trip to Flaine, a birthday present from his two boys. In May he and Eleanor went to a different country: to Vienna to watch their youngest run in a half-marathon – and enjoy the food, of course! The months of July to September were spent

again in the Pyrenees house where the heat became so unbearable that they had to buy a small portable air conditioner to keep the temperature down to about 27 degrees. A mere month after returning to the UK in September they were back again to hear the final outcome of their long legal battle with the next-door neighbour over a boundary dispute – they had finally won! After that things went quiet until the birth of their second grandson, Basil (as in Fawlty!), born at the end of December. So they now have three grandchildren, in chronological order: boy, girl, boy.

Simon Pengelly

Simon has just recently found our group and writes that, after Imperial, he went back to BT and worked on testing standards – drafting, negotiating, and trialling. This was initially for exchange acceptance from contractors, then for both national and European liberalisation of network attachments, and also for electrical safety. He 'retired' (was made redundant) during divorce in the mid-1990's and moved to the Isle of Thanet when his pension kicked in and he became solvent at 50. Then he remarried and worked part-time as an IT technician at a local school. Sadly Simon's wife died at the beginning of October.

Steve Glenn

Steve continues to be a community driver and has now become a debt counsellor as well. He is also doing a Master's degree in History. Steve says, 'As I am rapidly becoming history, I thought I should find out something about it.' The grandchildren count has now risen to 7, with the latest arrival, a boy, in March 2023.

Tony Godber

Tony said that he is continuing to work predominantly on reduction and eventual elimination of greenhouse gas emissions on Rio Tinto's iron ore rail network. His initial (often solo) efforts to develop the overall strategy have now evolved into a fully resourced project with a growing team. This will allow him to transition smoothly into retirement, which he has planned for around mid-2023. His major achievement this year is an order for four battery electric locomotives from Wabtec in USA. These will be used for a proof-of-concept stage to evaluate their performance in an operational environment and determine how they could be effectively deployed in larger numbers. On the family front, his father-in-law was finally able to travel from the UK to live with the family in Perth. This was almost two years later than originally planned due firstly to COVID travel restrictions then poor availability of

flights. Tony's two granddaughters are growing very fast (25 and 18 months old at Christmas) and a third grandchild will hopefully join them in June 2023.

Martyn Hart

Martyn is a Parish Councillor for his village (Ingatstone and Fryerning), looking after the business and welfare sides. He's instigated a number of markets and supported Alzheimer training in the village shops. The electric car he built for the grandkids has now grown to a four-seater and can be seen (on dry days) transporting them around. His noise-cloaking project is still running and this year he produced the 'thunder module'. He continues to cycle (on his home built electric bike), take photographs (he actually won a competition) and has of course been busy redecorating the Triangle House.

Those who couldn't make it and we've heard from:

Dave Mansfield

Dave gave his apologies for not being on the Zoom; he said that his New Year pledge for 2023 is to not attend any more virtual meetings! 2022 had been a very difficult period for him and Liz with the major renovation of their house in the UK. The project was beset with a series of disasters: Dave had to sack the builder for non-delivery in January, followed by rising material and labour costs plus a shortage of skilled tradesmen in Cambridgeshire. After 15 months of living in rented accommodation, they moved back to 'camp' in the house in September but he adds that there's still much to do before they can unpack their belongings. Really good news in 2022 was that they had their first grandchild in March!

Geoff Banks

Geoff reported that he has finally recovered from the radiotherapy treatment for prostate cancer he had in 2022 and a very recent MRI scan has shown no problems now. Apart from that he has had a quiet and relatively calm year and he is looking forward to an even quieter new year! He hopes that he can make one of our reunions in 2023 and he thinks that the move from January to May is a good idea as most Triodes have now retired from working in London.

George Wloch

This year we made contact with George but he couldn't get to our January meeting as he was in Paris. He sent an update saying that in 2022 he was developing an MSc in Fintech and Finance for the

Greenwich Business School at the University of Greenwich, where he teaches. The first lecture is due to be delivered in Sept 2023. He is hoping to come to our reunion in November.

Graham Castellano

Sadly, Graham's father died in February 2022 after going into hospital at the start of January. Graham was faced with the Covid charade, so he couldn't see him again until he died. Probate rumbled on for most of the year and is still ongoing. He still has his mother living locally and keeps an eye on her. The Castellano family holidayed in the IOW (surprisingly good and all by bus and ferry, which was easy as they live in Southsea!) and then later the Italian Alps, where they went skiing. They met up with Joan Clemow in Dorset with some of her friends to celebrate her 70th birthday. Graham is still volunteering at the Repair Cafe, doing lots of grandchildren-sitting in Somerset, walking with the 'Senior Strollers' (a group of friends) and still dinghy sailing.

Hari Singh

Hari's general health has been OK but arthritis eventually caught up with him and he had to have his hip replaced in September. This was a planned operation and he says the NHS did a brilliant job; he only had to wait just over 3 months and now can walk normally without pain. Hari is still playing a lot of golf but his Handicap Index has gone up to 13! He managed to get golf trips to France and Portugal during 2022. His family are doing fine and his four grandsons (aged 5,7,9 and 10) are growing up fast and are a lot of fun. By the time you read this Hari will be on a long trip to Goa which he starts at the end of January.

Jay Yiakoumetti

Jay was also found through Imperial College and tells us that after graduating he took an MSc course in Systems Engineering (Control & Instrumentation) at City University. He chose a process control specialisation together with Nick Bogdanovic. (Triodes might remember Nick, he came from Yugoslavia and sadly died in a tragic road accident shortly after completing his MSc.) Jay worked for GEC Automation, followed by ITT, STL, and ICI Petrochemicals and Plastics. He spent some time in Saudi Arabia and Dubai before setting up an IT business in London and then working for Hewlett Packard Consulting. 30 years after graduating Jay went back to IC for a full time MBA course and then worked in business strategy in the construction industry. Since retirement he has been running a small property

investment company. He is currently also looking into the feasibility of a solar power generation park in Cyprus. Jay is married with 3 children (Andrea, Antonia and Andrew) and is looking forward to the birth of his first grandchild in March!

Joan Clemow

Joan said that nothing much has changed this year. She is still enjoying her retirement, where her time is fully occupied by volunteering for the National Trust, being treasurer for a couple of clubs and, most importantly, by her grandchildren. Recently she joined a French conversation group so that she can keep the grey cells going and maintain her level of fluency, which was slipping.

Paul Cheung

Unlike Peter Cheung, Paul has been retired for over 4 years now, but he is still working as an honorary professor at HKU and teaches two MSc courses with over 250 students, which keeps him rather busy. He and Jane spend a few months in London every year despite Covid in order to spend time with their granddaughter Lina (and teach her Chinese). Lina is now 3 years old and growing fast. Paul still runs his Pen Makers Workshop, but because of Covid, he uses it more like his own private workshop! Paul plans to go to London again this summer, in particular, to celebrate our 50th anniversary of graduating from Imperial in 1973! This year, with Covid restrictions relaxing in Hong Kong, they had Christmas and New Year with all the family members in Hong Kong and were joined by Peter Cheung and family. His offer to invite Triodes to dinner is still open if you visit Hong Kong, hence remember to contact him if you plan to visit!

Peter Marlow

For Peter and wife Sally, 2022 was a catch-up year. Their son finally got married (third time lucky!) on a gloriously sunny day in June. They drove around Iceland in July and visited Madrid to celebrate Peter's 70th birthday. They toured with their chamber choir to Athens in October (which had also been postponed twice). Peter's work with project management charity PM4NGOs took him to Amman, Jordan, in November.

Rut Patel

Rut spent most of his year supporting his two grandsons and two granddaughters. His highlight was his 70th birthday bash, held together with his grandson's 7th! This took place in his daughter's garden in July. His son-in-law hired a cricket simulator which included

a ball throwing machine enclosed in a traditional cricket net. This brought hours of fun for young and old alike! Coincidentally that day was also the final of the Women's Euro at Wembley and they watched the winning goal in extra time. In February he managed to get a few days in Dubai with his grandsons and in August he went with his family on a birthday holiday to Greece in an all-inclusive Ikos resort. Rut also enjoyed a wedding reception he attended at the Savoy Hotel in April! In between he was at Edgbaston, the Oval and the St Ageas Bowl watching England play India at cricket and at Wimbledon for the first round of the tennis. In September he went with his wife to watch the late Queen's lying-in-state procession to Westminster Hall. They were near Admiralty House in Whitehall and afterwards they walked to Buckingham Palace, but not before a pint at the Civil Service Club nearby. Rut also still does his regular walks in Nonsuch Park in Cheam and swimming at David Lloyds.

Sid Seth

2022 went well for Sid and his family and, like a lot of us, he turned 70 in July. He says that the good news for the year is that he became a granddad as his daughter gave birth to a son.

Tim Dye

Tim says that 2022 was a quiet year for him with little TV work but, like others, celebrations around his 70th made the year special, as well as another grandchild appearing in time for his birthday. During the year he cycled the Tissington Trail with an old school mate and later, with his wife Sue, re-visited their favourite Croatian islands. Living close to the Norfolk beaches helped them cool off during the heatwave in the UK during the summer. They enjoyed short breaks to St Albans and Whitby in cooler times and also many walks in Norfolk and Suffolk.

And those who didn't make it and we haven't heard from:
(Can anyone help?)

- John Baird
- Jackie Buzzard
- Al Farbridge
- Chris Gaukroger
- Ian Heap
- John Macfarlane
- Keith Marshall
- Alistair Rogers
- Richard Wysome.

Martyn, Arch Triode

(martyn_hart@btinternet.com)

ALUMNI



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TO WRITE FOR US

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

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

1 Not including kiss-and-tell or libellous allegations!

STOP PRESS

PROFESSOR PATRICK DOWLING
(Civil Eng 1961-66)

As we were going to press, we learnt of the death of Professor Patrick Dowling. He had been ill for a while and had been in hospital for about a month before his death. The funeral will be in Guildford on the afternoon of 31 May.

Patrick studied for his PhD and DIC in the Department of Civil Engineering between 1961 and 1966. He was President of CGCA in 1999-2000, and was Head of Department for Civil Engineering until he left to become Vice Chancellor Surrey University in 1994.

We are planning a fuller obituary in the next issue of Imperial ENGINEER.

