



Imperial ENGINEER



RIO TINTO INTERNSHIPS
CROSSNESS CATHEDRAL
POLLUTION IN NIGERIA
CIVSOC IN BUDAPEST
MAKING DRUGS
BO VISITS CERN





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Photograph by James Devine (Elec Eng 2005) former Bo driver now working at CERN – © CERN / J. Devine

Imperial ENGINEER

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All the links in this issue can also be found in our IE21 bundle at:
<http://bit.ly/IE21links>

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I want to start this report by thanking my colleagues and members for their support in electing me back in June as your President for the ensuing two years: an honour but definitely not a sinecure!

As is often the case with Associations like ours, there is much necessary behind-the-scenes work to be done – planning the calendar etc. – and this summer has been no exception. So before I go any further, may I start by thanking all my colleagues on the committee – and especially outgoing President David Nethercot, our Hon. Sec., Nigel Cresswell, Hon. Treasurer, Peter Chase, Annual Dinner organiser, Colin Kirk, and Imperial ENGINEER Editor, Peter Buck – for all the work that they do and have done not only with great skill, but such good humour too. It's already been a great pleasure working with them over the run-up to my stint as your President, and I am sure it will continue that way.

I know from my past roles of Hon. Sec., Treasurer and Membership Secretary that one of the especially positive aspects of getting involved in CGCA is developing relations and assisting the rolling cohorts of current students. And this year is no exception. Over the meetings this summer, we have had the pleasure of getting to know this year's President of CGCU, Tim Munday. And then, on October 7, we had what I believe to be a really important 'first' – a session between CGCA's new Departmental Reps and leading students, such as Departmental Society Presidents and Secretaries, from each of the seven departments we link to. Some very positive ideas emerged – for more proactive links, additional activities to support the societies in providing something different to their normal programme, and a strengthening of the links to CGCA for when the current cohort graduate. It was a stimulating evening – on the evidence of the students on just that one evening, not only Imperial College but the planet is blessed with a bunch of bright, enthusiastic budding engineers who care for the world they and wider society inhabits and want to do something positive to make it better.

My wife Jean and I have also had the pleasure of attending the celebration of 100 years of a civil engineering department at Imperial. A tour of the facilities ably demonstrated that some things stay just the same for a very long time (the architecture and style of the Skempton Building and flumes for hydraulics teaching!) and much else changes very significantly (the fight to keep a physical library in the Department and the nature and scale of the research effort).

That event also introduced us to a new recruit in a new post in the College's Development Department – Nic Katona, Head of Development, Faculty of Engineering. Nigel Cresswell and I have already met up to discuss a range of areas from collaboration to more mundane but equally important matters such as information exchange and restoring and enhancing access to data about you – our members – held on our behalf by IC. We look forward to a mutually fruitful collaboration with Nic and his colleagues.

Finally, may I draw your attention to the details of the Annual Dinner date and Christmas event elsewhere in this issue of Imperial Engineer. I look forward to meeting members there and to meeting as many of our members as is practicable in my two year term.



**Roger
Venables**

PRESIDENTS REPORT



**John
O'Reilly**

The period since the last issue of the Imperial ENGINEER has been a relatively quiet one in respect of RSMA activities. The 2014 Annual General Meeting was held on June 28, followed by the Final Year Bar-B-Q. The rain did not dampen the enthusiasm of the students, many of whom were due to receive their degree results the following day. As in previous years, Eddie Gadd had kindly donated 2 pints (72 pints) of his Ramsgate Brewery's finest ale which was very much appreciated and helped to remove any doubting thoughts of the following morning's events. The (unapproved) minutes of the AGM, including the President and Treasurer reports have been posted on the RSMA website.

The RSMA was represented at the IC Alumni reunion day in May and the RSMA stand, complete with a display including banner, Davy Lamp, Bottle and RSM memorabilia, was well received.

The 130th annual dinner will be held on Friday 28 November at the Rembrandt Hotel, Knightsbridge, the venue of last year's successful event. As this is a significant milestone in our history, it is hoped that as many members as possible will attend. A group e-mail has been sent to all members giving details of the event. Guest speaker will be Dr Mike Harris ARSM, Visiting Professor at the Department of Earth Science and Technology at the RSM, who is also Director of Business Development, Copper for Rio Tinto.

In conjunction with the e-mail to members re the annual dinner, we have renewed our funds appeal to members. As I have previously outlined, the RSMA relies on the financial support of alumni, through membership fees and donations, and the committee is most appreciative of the generosity of alumni to date. A sustainable future requires ongoing support.

The student executives for this academic year are Ben Warnick, President, and Simon Escobar, Secretary. I have had a meeting with Ben to discuss ongoing co-operation and we look forward to continuing to support the RSMU. Following last year's successful presentation to students on the

history, aims and membership of the RSMA, Ben has requested that a further presentation be given to the students in the autumn term.

Our presence on the social media outlets (LinkedIn, Facebook) continues to strengthen and, for many, has rekindled contact with fellow classmates, colleagues and alumni. John Sykes, our Vice President International, has been very active in promoting the RSMA in these areas. The website continues to improve and be informative primarily due to the efforts of Elly Jay, senior Vice President. Members are welcome to forward items, to Elly or the committee, that they feel may be of interest to fellow members for inclusion on the website.

I am sure that recipients of the Imperial ENGINEER can only be impressed by the professional production. Any member is encouraged to submit an article, technical or general interest, for publication.

NEWS & REVIEWS

New CGCA Committee and OC Trust members

President:	Roger Venables
Vice Presidents:	Judith Hackitt / <i>unfilled</i>
Hon. Secretary:	Nigel Cresswell
Hon. Treasurer:	Peter Chase
Dep Reps:	
Aeronautics:	David Hankin / <i>unfilled</i>
Bioengineering:	<i>unfilled</i> / <i>unfilled</i>
Chem Eng:	Frank Brown / Peter Lynch
Civil & Env Eng:	Atula Abeysekera / Colin Kerr
Computing:	Chris Hankin / <i>unfilled</i>
Elec & Electron Eng:	Colleen Richardson / Christopher Baker-Brian
Mech Eng:	Warwick Faville / Charles Parry
Academic Staff Member:	Lorraine Craig (DUGS)
Membership Secretary:	Chris Lumb
Deputy Hon. Secretary:	Peter Lynch
Deputy Hon. Treasurer:	<i>unfilled</i>
Younger Members' Secretary	<i>unfilled</i>
Annual Dinner Event Manager	Colin Kerr
Decade Reunion Event Manager	David Law
Webmasters	Neil Madhvani / Nigel Cresswell
IE Editor / Editorial Board Rep.	Peter Buck / Colleen Richardson
OC Trust Trustees:	
Consul of the Faculty of Engineering:	Prof. Richard Jardine (ex officio)
Hon. Secretary, CGCA:	Nigel Cresswell (ex officio)
Hon. Treasurer, CGCA:	Peter Chase (ex officio)
Nominated by the Board:	Chris Lumb (Chairman), J B Spooner
OC Trust Ordinary Members:	
J Collins, D M Curtis, C J Kerr, D J C Law, D Lehmann, O Pell,	
Prof. R C Schroter, CGCA President, CGCU President,	
CGCU Alumni Officer	
R E Knight, Founder Member of Trust Board	

New RSMA Committee and Trust members

President:	John O'Reilly
Senior VP:	Eleanor Jay
Junior VP:	Tim Cotton
Past-President:	Mark Burridge
Hon. Secretary:	Paul Holmes
Hon. Treasurer:	Daniel Hill
VP International:	John Sykes
Membership Secretary:	Coen Louwarts
Committee Members:	
Lorraine Craig	
Prof. John Monhemius	
Rees Rawlings	
David Bishop	
Ben Warnick – President RSM Union	
Simon Escobar – Hon. Secretary RSM Union	
Luc Vandepierre	
Matt Cockayne	
Hannah Bungey	
Overseas:	Giles Baynam (Canada)
	Leah Glass (Australia)
RSMA Trust	
Board Members:	Trustees:
Prof. Rees Rawlings (Chair)	Prof. John Monhemius
John O'Reilly	Daniel Hill
Fiona Cassidy	Paul Holmes
Coen Louwarts	Ben Warnick – RSMU President
David Bishop	Glynne Lloyd Davies (Hon. Secretary)

New CGCA President, Roger Venables, is a civil engineer, marketer, and sustainability specialist and champion.

Roger Venables took over the CGCA Presidential reins from David Nethercot at our AGM in June and, like David two years ago, looks forward very much to his two-year term. Roger comments first: "David is both a hard act to follow, to emulate his vision, enthusiasm and energy, yet also an easy act to follow, because he has laid strong foundations for the Association's future. In particular, he has masterminded and led the change to our members being represented by Departmental Reps rather than 'years at college' reps and we thank him for that and his other changes. Now we have to implement that new structure and develop stronger relationships and activities for the benefit of all our members – alumni, staff and students, especially the students." The first event to start to develop those stronger relationships and activities was held on October 7 and Roger has outlined the positive nature of that event in his President's Report.

Roger is no stranger to the leadership of CGCA. He was Honorary Secretary for three years in the early 1990s, then Treasurer until 1997 (and again, briefly, in 2000), before a spell as Membership Secretary into the noughties. So he brings much relevant CGCA experience to his new role, but he is also very conscious that much has moved on for the College, its staff and students, and our alumni members. "So CGCA's activities,

stance, communications and relations with the college, students and its members must reflect and take account of those changes."

Alongside active involvement in CGCA, Roger has also been a long-standing active member of the Institution of Civil Engineers (ICE), from chairing the Association of London Graduates & Students and the National Graduates & Students' Committee, to a spell on ICE Council and chairmanship of the Environment & Sustainability Board in the early 2000s.

Roger Venables is now a Director of Venables Consultancy, Managing Director of consultancy Crane Environmental Ltd, Chief Executive of CEEQUAL, the Sustainability Assessment, Rating and Awards Scheme for Civil Engineering, Infrastructure, Landscaping and Public Realm works, and Editor of *Innovation & Research Focus*, the built environment I&R Newsletter and website. He is a Fellow of the ICE, a Member of the Institute of Marketing, and very proud to be a Fellow of the City & Guilds of London Institute, FCGL.

Roger has what he calls "quasi-academic roles" as well. He has held a Royal Academy of Engineering Visiting Professorship in Engineering for Sustainable Development at Queen's University Belfast since 2003, and has been a Visiting Lecturer on the MSc in Construction Management at City University since its inception in 2008. He delivered

the 3rd ICE Brunel Lecture, on *Delivering Sustainable Development*, more than 20 times around the world from 2001 to 2003.

His earlier career was initially with contractors George Wimpey & Co, where he first got the bug for creating innovative solutions, followed by 15 years at CIRIA, the Construction Industry Research & Information Association.

So, alongside CGCA and the Institution of Civil Engineers, two more important strands to Roger's career emerge: innovation & applied research, and improving environmental and sustainability performance of the built environment, especially civil engineering.

And how did all this start? Roger studied civil engineering at Imperial in the late 60s, where he not only graduated (!) but also had the delight of meeting his wife and business partner-to-be, Jean, and discovering that they could be a pair and work together as well – evidenced by Venables Consultancy being 25 years old this year! So another important strand to his life and career we should highlight has been (and continues to be) working with and supporting Jean in her own, illustrious career – flood risk management expert, Chief Executive of the Association of Drainage Authorities, President of the Institution of Civil Engineers for 2008-9, an MBE, OBE and CBE for services to civil engineering and flood risk management, and recently

appointed Chairman of the Nuclear Liabilities Fund.

So, finally, what does Roger want to bring to CGCA from all this experience?

"Reviewing David Nethercot's profile in Imperial Engineer of two years ago, I have a strong sense of carrying on the torch he lit for change in the Association and its profile in the College. Yet we must also continue to search for innovative activities and ways of serving alumni and students. We need to make ourselves so relevant to our target member groups that we become a default choice for staff in departments affiliated to CGCA, and an automatic choice for all graduating students to join after their free membership as a student. Yet we also need to make ourselves as relevant to alumni who go to work for non-traditional employers of engineering graduates as we are to alumni working in the engineering sphere. I look forward very much to working with College, including Alice Gast the new President of Imperial, members of the Development Office (some of whom I was delighted to meet at the Dinner on September 25, to celebrate 100 years of the Civil Engineering Department at Imperial), and look forward to working with them, our members, our committee members and our prospective members – the students – to deliver an increasingly vibrant and effective Association."

From the CGCU President's desk...



Tim Munday

While I write this, I have now been in the job for a month and I am more than pleased with the progress that's been made so far. The CGCU Office looks 'swisher' than it has in a long time with our honours shields now proudly on display and I have even been able to claim a messy little corner as the President's Desk. After many long hours spent by my dedicated team getting it ready, our handbook 'The Spanner' has once again been sent out to our newest members. They will also receive an invitation to our flagship Welcome Dinner, our annual reception for first years in the Guilds Departments of the Faculty of Engineering. This is just one of the events that I have spent this summer planning; others include careers evenings, bar nights and a mince pie party. As well as an essay competition set to rival the RCSU's excellent Science Challenge.

I have dedicated quite a bit of my time to improving and establishing CGCU's relationships with our partner organisations. Our Departmental Societies, always individually strong, will hopefully this year benefit from us creating an atmosphere of greater co-operation. We are also working hard with them and the CGCA to give the CGCU a greater exposure to students at a departmental level. I have also met with my counterparts in the RSMU and RCSU and we are now preparing for some joint events as well as committing again to some

good, old-fashioned mascotry antics.

Right now, a hundred miles north of CGCU HQ, in my home county of Norfolk, the harvest is coming to an end. I know this because I have spent the last three summers working that harvest in a seed treatment plant. As a job it was okay, a bit dusty, but most importantly it paid the rent. And if it hadn't been for a little election back in March I would be there right now. Instead, I get to do a job I love, leading an organisation with a lot of potential to make studying engineering at Imperial that bit better.

But it wasn't just because of that election that I was able to become CGCU President, because, put simply, I could not have afforded to. Fortunately, ten years ago a CGCU Sabbatical Fund was established and, thanks to the many generous donations back then, the CGCU President is paid to work for two months in the summer; CGCU has the time, dedication and man power required to get it prepared for the new term, and I am able to pay my landlady for another year. I know it's not particularly humble to say, but I think CGCU has got a good year ahead of it and I am very grateful for the opportunity to lead it.

Tim Munday

If you'd like to find out more about how I've been spending my Summer Sabbatical I have been writing a blog: <http://bit.ly/1E21-GuildsBlog>



Tim Munday

Main meeting table

RSM Freshers' Dinner caps off a successful fortnight

The summer months were spent catching up with friends back home, travelling, earning money to blow on rent and, for some, geological mapping. Mixed in with this, the Royal School of Mines committee had carefully planned their start of term activities leading up to the big one: Freshers' Dinner.

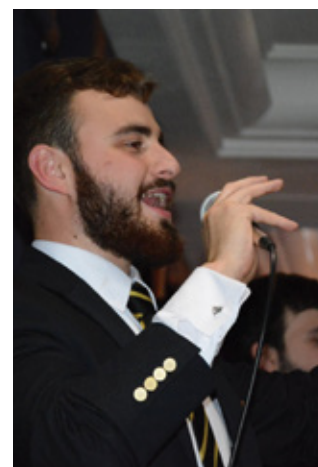
On October 17, 178 people attended the annual dinner at The Rembrandt Hotel, 91 of them freshers from the Materials and Earth Science departments. It was a strong reflection of the high demand for the social events that the RSM provides for its members.

All the first years, accompanied by their older undergraduate hosts, marched along Exhibition Road looking rather dapper and not too out of place out and about in South Kensington. Upon arrival at The Rembrandt they were greeted by an array of black and gold decorations, and empty helium tanks that definitely weren't inhaled by Vice-President James Cox. President Ben Warnick started proceedings with an impressive welcoming speech, including an hysterical poem read from the "RSM Bible".

The three course meal went down a treat with everyone, a different league from those student budget-meals that friends at other universities cook and upload pictures of onto Facebook in the hope of a few 'likes'. No, this was a formal three course dinner from a five star hotel in Kensington, food we at the RSM like to savour for our big events: chicken liver pâté with compote, cod fillet with creamy chive sauce, ratatouille and potato rosti cake to name a few.

Also in attendance were two guest speakers: Dr Martyn McLachlan from Materials and Dr Matt Genge from the Earth Science department. Both are popular lecturers among students in their respective departments, and quickly became the centre of attention with eye-catching and funny speeches to the audience.

One highlight of the evening included third year geologist Matt Irwin, who took centre stage, declaring that his table would like to raise a toast to the President and his committee for organising the event. Then all five hosts and five freshers at the table stood up, and literally 'raised a toast' by holding aloft slices of toast to the committee table. Their pockets may have been filled with burnt crumbs, but the gag was successfully pulled off. Very well played from the boys.



After the closing speeches – as is standard – the Scottish contingent of RSM spontaneously burst into song as "Flower Of Scotland" rang through the room. This was not planned, and was not prompted for any reason, but it did not stop Dr McLachlan joining in and taking lead. The RSM, still looking stylish in their formal wear, proceeded to head back through South Kensington for a post-dinner gathering at the Union, which included discussions along the lines of "what a jolly good dinner that was".

It was the first time that the Fresher's Dinner had been held at The Rembrandt; rave reviews came from those who attended and even hotel staff.

A big shout out goes to Vice-President Tor Tennant and Ball Officers Abbie Trice and Bethan Clark for organising the event.



Bo's Alpine holiday



© CERN / J. Devine

Following last summer's successful tour, this year Team Bo took Bo and Derrick on a week's trip across Switzerland and into Italy. Five student members went along, although Sam Esgate (Computing) the current President of Team Bo is the only one insured to actually drive Bo.

Bo and Derrick were driven approximately 130 miles past Swiss lakes, over the Glarus Alps, through the Swiss National Park and briefly into Italy. A minibus was used to act as support and team transport vehicle, as well as to transport Bo and Derrick to and around Switzerland.

En route, the team took Bo' to visit CERN where they were welcomed by James Devine (Elec Eng 2005) former Bo driver. Bo attracted the attention of many of the technicians, security guards, engineers and physicists working on the CMS experiment, including Prof. Sir Jim Virdee (Physics) one of the CMS co-founders. The team were also treated to an impromptu underground tour of the experiment

(without Bo, sadly).

Bo and Derrick drove beside Lake Thun to Interlaken and then around Lake Lucerne to Flüelen and thence on to Glarus via the Klausen Pass. Bo was once again trailered to Zernez, from where it was driven to Santa Maria Val Müstair and then over the border into Italy to Mals. Finally, both Bo and Derrick were put back on the trailer for the return trip to South Kensington.

The cost of the trip was covered by the students themselves, the club and the Bo Fund. The Bo Fund is held by the OC Trust on behalf of the quite large team of former Bo drivers and enthusiasts. This fund had also previously supported the training of several students in trailer towing, without their certificates for this the trip would not have been possible!

For more on Bo's visit to CERN you can read issue 51 of *UK News from CERN* which includes a report by Stephanie Hills, CERN's Press Officer, at:

<http://bit.ly/IE21-BoCERN>



Team Bo

Bo and Derrick at the Klausen Pass



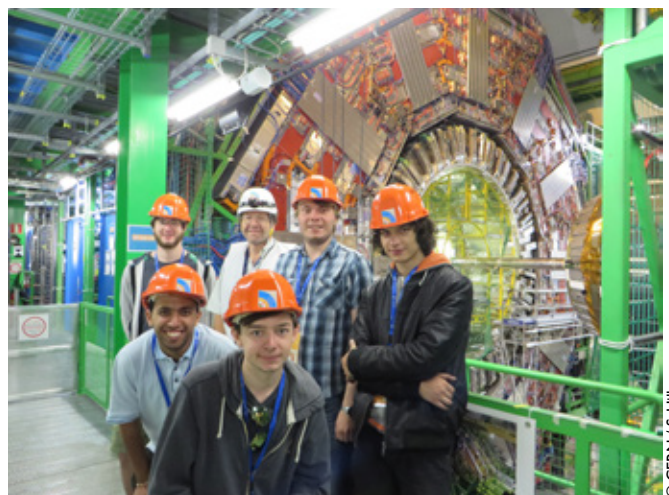
© CERN / S. Hills

Team Bo with former Bo driver James Devine and CMS co-founder Prof. Sir Jim Virdee



© CERN / J. Devine

Jim Virdee and Austin Ball were keen to look under the hood



© CERN / S. Hills

Team Bo get an underground tour of the experiment from CMS Technical Coordinator Austin Ball

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

£40M gift from alumnus Michael Uren OBE to build biomedical engineering centre

Imperial announced in May that it is to build a pioneering biomedical engineering centre thanks to a £40m gift from alumnus Michael Uren OBE and his foundation. The donation will support the construction of the Michael Uren Biomedical Engineering Hub, a building at Imperial West, the College's new 25-acre research and innovation campus in White City, West London.

The centre will house life-changing research into new and affordable medical technology, helping people affected by a diverse range of medical conditions. Imperial's world-class engineers, scientists and clinicians will work together in the new space and facilities alongside spin-out companies, helping to create a vibrant innovation district at Imperial West. The Hub will also incorporate clinical areas, providing patients with direct access to innovations in healthcare.

The building and its location will cement Imperial and the UK's position as world-leaders in biomedical engineering research and application.

Sir Keith O'Nions, Imperial's President at the time, said: "Imperial is profoundly grateful to Michael Uren and his Foundation for this remarkable gift, the most generous it has ever received. It will create a wholly new building and set of facilities for engineers and medics to come together and make new discoveries and innovations on an unparalleled scale. It provides enormous impetus to the development of Imperial West as an innovation district."

Michael Uren OBE (Mech Eng 1940-43) founded Civil and Marine Ltd and built it into one of the UK's foremost innovators in cement manufacture. He is already regarded as one of the UK's most generous philanthropists in the fields of medical research, education, the armed forces and conservation of wildlife. His previous multi-million support for Imperial includes the College's MSk Lab under the leadership of Professor Justin Cobb, whose focus is joint disease and the surgery needed to restore function. Michael said: "It is an honour for me to be able to help this great university. Medical teaching and research didn't exist at Imperial in my day, but it has evolved into an institution where the work between



engineering and medicine is today one of its outstanding strengths. Imperial has always applied academic excellence for the greater good, and I am thrilled by the prospect of this Biomedical Engineering Hub doing exactly that. What I find so exciting about this project is that here is Imperial building one of the biggest research centres in the world within a few miles of the City of London, which itself has become the biggest financial centre in the world today. By putting the two together, what is quite clear is that the investment world will be watching for, and waiting for, the research and inventions which will create tomorrow's great companies. It seems to me that, in effect, what we are creating here is a new Silicon Valley London, which is bound to succeed. Imperial was inspirational when I first joined it as a young engineering student in 1940, when London was under attack every night, and it is inspirational today. May it continue to be so forever."

The Mayor of London, Boris Johnson, said: "I am absolutely delighted at this extremely generous donation that will push forward research in an exciting and crucially important area of medical science. Biomedical engineering is improving treatments and quality of life for people affected by a diverse range of medical conditions and this new centre has the potential to benefit millions in the UK and around the world. This donation, coming so soon after the launch of MedCity, demonstrates unquestionably that London and the South East is one of the leading regions in the world for game-changing science."

Imperial hosts largest ever bioengineering conference held in UK

Over 470 bioengineers gathered at Imperial for MECbioeng14, which brought together researchers from 40 universities, alongside representatives from industry, charities and government, to help foster regional and national networks and drive forward development of the UK as a global hub for medical innovation.

The inaugural event, combined for the first time the Medical Engineering Centres' Annual Meeting and the Bioengineering Society's annual conference.

Opening the event on 10 September, Imperial President Professor Alice Gast said: "It's very exciting to have the first joint meeting of the Medical Engineering Centres and the Bioengineering Society here at the College. It feels very appropriate to be hosting such a meeting at Imperial, which has always been ahead of its time in Bioengineering. In the 1960s, Imperial formed the Physiological Flow Studies Unit, the Engineering in Medicine Lab, and the Biomechanics Group. All of these groups were leading the way in their respective fields. This vision and innovation continues in Bioengineering at Imperial, and in many other Centres and Departments across the College.

"By its nature, bioengineering is one of the most collaborative academic fields, and Imperial highly values collaboration across disciplinary, institutional and regional boundaries. For this reason I am gratified to see this conference bringing together multidisciplinary Medical Engineering Centres from Imperial, Oxford, King's and Leeds – as well as the Wellcome Trust, EPSRC and the Bioengineering

Society.

"At Imperial, bioengineers ensure that their basic research gets translated for societal benefit. Imperial recently received a transformational £40 million gift from Imperial alumnus Michael Uren, which we will invest in a brand new Biomedical Engineering Research Hub at Imperial West. I hope many of you will be involved."

George Freeman MP, Minister for Life Sciences, addressed delegates as the conference came to a close on 11 September. He said: "It is a real pleasure to be here today at Imperial – an absolute powerhouse in the UK's innovation economy. The core underlying work that you are doing as bioengineers is utterly essential to the landscape of 21st century healthcare and medicine. You are laying the foundations for the companies, jobs, and the innovative treatments and products of tomorrow."

Professor Anthony Bull, Chair of MECbioeng14 and Head of Imperial's Department of Bioengineering, said: "The merger of these two events reflects what is good about bioengineering in the UK. As well as being well funded as a discipline, we have a vibrant collective spirit – and bringing you all together for this conference shows that in a powerful way."

Dr Jenna Stevens-Smith, Director of MECbioeng14 said: "We are delighted with the number of delegates attending the conference. As a bioengineer myself, I have seen the discipline grow over the last ten years and am keen to see the UK bioengineering community work more closely together to drive the discipline forward in the UK."

Kingsbury Scholar takes to the high seas

Thanks to a generous donor, a fully -funded place was made available for a student in the Engineering Faculty to take part in a Jubilee Sailing Trust voyage in September.

The Jubilee Sailing Trust is a charity that takes people of all abilities sailing on tall ships, and the funding for the student place included their 'leadership at sea programme' designed to work on leadership, team building, problem solving and disability awareness.

The place was awarded to Jessica Charter, a Kingsbury Scholar in Civil Engineering. She's had a busy summer, having just returned from working on this year's El Salvador

project to build an earthquake-proof house for a family of 17 using sustainable and local materials (see the Spring 2014 issue of Imperial ENGINEER for a report on last year's activities in the El Salvador project). Sustainability is a particular interest for Jessica who is striving to pursue a career in engineering focusing on 'green growth'. She has attended several International Sustainable Innovation Conferences and workshops to learn new ways to incorporate sustainability into daily lives.

You can read more about the Jubilee Sailing Trust at:

<http://jst.org.uk>

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

Imperial invests in entrepreneurship programme and prize for female students

Leading figures and supporters of women in entrepreneurship gathered on 24th October to celebrate the launch of the Althea-Imperial programme – a pioneering scheme to identify and inspire the next generation of female entrepreneurs. Imperial has teamed up with The Althea Foundation, the social venture philanthropic organisation, to invest an initial \$100,000 in a three-year entrepreneurship programme and prize for its female students.

Female undergraduates and postgraduates were invited to submit their business ideas to be included in a bespoke development programme designed to encourage and support more women studying science, technology, engineering and maths (STEM) to play a leading role in the next generation of innovative business leaders.

Entrepreneurs and keynote speakers Sherry Coutu and Dame Stephanie Shirley joined Imperial President Professor Alice Gast and programme champion Professor Maggie Dallman, also Dean of Imperial's Faculty of Natural Sciences, on stage. They talked about their experiences, shared their entrepreneurial wisdom, and encouraged female students to apply to the programme.

Angel investor Sherry Coutu made an enlightened and passionate case for the extra £1 trillion GDP that could be created by involving more women with a STEM background in establishing and scaling up new ventures. Software entrepreneur and charity founder Dame Stephanie reflected on a lifetime in business and shared the secrets of her success, which include only employing people who are better than you.

Dame Stephanie went on to invite established business people to share their journey and their successes, to encourage students to step forward and take a risk by applying to the programme, and to encourage mentors to give generously of their time. She finished by observing: "How I wish this Prize had been around when I started out".

"We are pleased to be collaborating with the Althea Foundation on this important programme", said Professor Alice Gast. "Entrepreneurship is at the heart of much of our work, and this programme offers us the opportunity to encourage women to develop their entrepreneurial ideas and create new and innovative enterprises. If we are serious about

economic growth, we must find more ways to support women in STEM fields and encourage them to pursue their ideas and start their own businesses. We look forward to working with mentors and business leaders to inspire, invest in and unlock the talent of the UK's next generation of women entrepreneurs."

"The Althea-Imperial programme has been designed to transform entrepreneurship opportunities for women in STEM," says Alexis de Raadt St. James, Founder and Chairman of The Althea Foundation. "Although more women are studying for STEM degrees than before, over 70% of them drop out of STEM careers. This new programme aims to reverse this loss of investment and talent by providing support for female Imperial students to pursue their entrepreneurship ambitions, and become the business leaders of the future."

The Althea-Imperial programme will support female students to develop their ideas through a range of sessions and workshops featuring business leaders, and one-to-one mentoring sessions for them to prepare their innovative ideas before pitching to a judging panel in May 2015. It will also create a community of peer support, as well as connect students to the broader entrepreneurship community at Imperial. The programme will support student entrepreneurs through the development of their ideas, with modules aimed at:

- helping them to solve grand challenges;
- unlocking their creative skills;
- developing their team leadership skills;
- learning from failure;
- harnessing public speaking skills in order to promote their ideas.

"We are launching this programme to ensure that Imperial continues to contribute the world's best minds to a new wave of female entrepreneurial leaders", says Professor Maggie Dallman, Dean of the Faculty of Natural Sciences and champion of the Althea-Imperial programme. "Speakers, mentors and judges on the programme represent some of the best minds in business today and I am delighted to be able to offer this exciting development opportunity to our students as part of their Imperial experience."

To find out more about the programme and how you can volunteer to help as a mentor or subject expert visit

<http://bit.ly/IE21-Althea>

Inventor of the Year and Faraday Medal

It's been a great year for Professor Chris Toumazou, Regius Professor of Engineering from the Department of Electrical and Electronic Engineering. In June he won Inventor of the Year (Research category) in the European Patent Office (EPO) European Inventor Awards, the only UK inventor to receive an award this year. In October he was awarded the Institution of Engineering and Technology (IET) 2014 Faraday Medal. Both awards are for his development of a device called the SNP Doctor, which uses small silicon microchips to identify genetic mutations that determine a person's predisposition to certain hereditary diseases. The portable, low-power device can analyse data on the spot rather than in a lab environment. The technology represents a great stride forward in medicine as it shifts emphasis from treating illnesses to preventing and diagnosing them in a targeted manner.

Professor Jeff Magee, Dean of the Faculty of Engineering, said: "The technologies that Chris has developed over the years not only have the ability to improve patient care, they are also important for the UK economy. His work is a perfect example of translating research into viable businesses that are helping to make the UK a leader in personalised healthcare." On the Inventor of the Year award Prof. Magee added: "Being the only engineer to be nominated in the UK for this prestigious award is a testament to his hard work and to the technical know-how of Imperial researchers." Professor James Stirling, Provost of Imperial College London, said: "This award really underlines what Imperial researchers do best – taking world leading research and applying it to help solve global challenges. The whole College warmly congratulates Chris. This award is a brilliant acknowledgement of his hard work and his innovative spirit."

Professor Toumazou's invention could make DNA testing more economical for clinics and hospitals that once had to spend upwards of half a million US dollars on conventional DNA-sequencing machines. It also gives patients results within minutes rather than weeks.

The technology also has economic benefits for the British economy. The global market potential for DNA sequencing is huge. By 2016, it is expected to be worth US \$6.6 billion and grow by 17.5% annually. The emergence of



Imperial College

breakthrough technologies such as Professor Toumazou's cost-efficient application for testing DNA could potentially help the UK to be a leader in this field.

Professor Toumazou has established the DNA Electronics (DNAe) company through Imperial Innovations to market the SNP Doctor. The company has already entered into collaborations with Roche and Pfizer. It also actively licenses its patents to licensees including Life Technologies and the National Institute for Health Research.

Professor Toumazou received a degree in electrical engineering at Imperial. He began his career developing energy-efficient microchips for mobile phones. At the age of 33, he became the youngest professor to teach at the College, where he focused on ways of combining electrical engineering and microchip technology with biomedicine – an achievement all the more remarkable for someone who left school at 16 with no qualifications.

Toumazou's decision to delve into the world of genetic disorders came about after his son Marcus was diagnosed with a rare hereditary form of kidney disease. He aimed for a technology that would facilitate early detection, helping medicine go from healing illnesses to preventing them.

Commenting on the award of the Faraday Medal, Professor Toumazou said: "I am very thankful to the Institution for considering my work for this prestigious award. Being chosen as the 2014 winner is a true honour. Throughout my entire career I have worked to bring electronic inventions to healthcare markets where there is a critical and urgent need. For me, the ability to use semiconductor sequencing to provide a medical diagnosis in just a few hours that once took days is a crucial step in saving the lives of patients. This is particularly significant for the treatment of sepsis – a whole body inflammation – where every minute matters."

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

Imperial improves position in rankings

In the QSWorld University Rankings, announced in September, Imperial rose to joint-2nd – the College's best ever performance – behind MIT, tied with Cambridge and just ahead of Harvard.

In the Times Higher Education World University Rankings, published in October, Imperial rose from 10th to 9th place in the world overall, equal with Yale. It was placed 2nd in Europe behind Cambridge and 6th in the world for engineering and technology.

In national rankings the Computing department has, like last year, been ranked 2nd behind Cambridge by The Complete University Guide, 2nd behind St Andrews by The Guardian and also 2nd by The Times/Sunday Times.

Meanwhile in the National Student Survey, Imperial has matched last year's highest ever performance with 87% of final-year survey participants 'definitely' or 'mostly' agreeing that their overall experience at the College was satisfactory. This is 1% higher than the sector average of 86%. Academic Support achieved an 83% satisfaction rate (4% up on last year), with 95% for Learning Resources (10% above the sector average), and 67% for Assessment and Feedback (up 1% on last year and up 13% since 2011). Imperial was above the sector-wide average for all categories except Assessment and Feedback which was 5% below the average. The response rate was the highest ever, with 84% of eligible students taking part. The results place Imperial first among the Russell Group universities in London.

Renewable energy can help UK to prosper

The UK can continue to prosper in terms of its energy resources by exploiting wind and marine power, says Professor Tim Green, who is the new Director of Imperial's Energy Futures Lab (EFL) as well as Deputy Head of the Department of Electrical and Electronic Engineering. In an interview on the Imperial News website he says, "the UK has been extraordinarily lucky in terms of energy, we founded the economic strength of the nation on the industrial revolution, built on coal, and we've had gas and oil, but now we enter a different era where we find ourselves with quite abundant wind resource and marine energy resource so we've got to exploit those two energy resources. But it's going to be a mixed energy picture, we're not going to suddenly stop using fossil fuels, but what we need to do is start doing carbon capture and storage technologies to make the impact on the climate less. We still have to manage the variability of the wind and the tides in our energy generation. Clearly, moving to sustainable energy is not something an individual nation can do on its own, it's important that the UK takes a leading position and Imperial has a strong role in influencing what the UK does, but we need to work with partner organisations across the world. Our researchers already have a global standing and we need to come together, as a team of researchers in energy, to have impact on the energy technologies and the energy debate on a world stage."

You can listen to an audio recording of the interview at <http://bit.ly/IE21-EFL>

Imperial researchers elected to fellowship of Royal Academy of Engineering

Of the 59 new Fellows elected this year in recognition of their outstanding and continuing contributions to engineering, 4 are Imperial researchers. Imperial now has 87 Fellows in total.

The new fellows are:



Imperial College

Professor Andrew Amis, Department of Mechanical Engineering, who said: "Being a Fellow is recognition of the work that I have done over the years. I hope that joining the Academy will lead me to meeting and learning from other leading engineers, which is exciting."



CCFE

Professor Steve Cowley, from the Department of Physics, and also Chief Executive Officer of the UK Atomic Energy Authority, who said: "Successful countries value their engineers. I don't think the UK values the work of our engineers enough. That is why The Royal Academy of Engineering is so important, because it shines a light on the amazing research that people around the country are doing. I am extremely honoured that the Academy has elected me a Fellow and I hope to help them in any way I can."



Imperial College

Professor Anthony Bull, Head of the Department of Bioengineering, who said: "I'm simply delighted to have been elected to this Fellowship. It is an honour and recognition for the discipline of Bioengineering, a discipline that has a track record of societal impact and is set to grow even more in significance and influence as we face the demographic time bomb of a growing, ageing population and all that that brings."



Imperial College

Professor Michael Lowe, Department of Mechanical Engineering, who said: "I'm absolutely relieved that none of my colleagues have told me they think me receiving a Fellowship must have been a mistake! Jokes aside, this honour means a great deal and I am delighted to have been elected. But I am also profoundly aware that this is recognition of the achievements of the outstanding team of researchers, past and present, working in my research group over many years. I am most grateful to them."

Construction starts for new Hub

A ceremony to break the ground for the start of construction of Imperial West's Research and Translation Hub took place on 16 October.

The £200 million, 48,000 sq m Hub will form the centrepiece of the Imperial West innovation district in White City, West London, and will include high specification, multidisciplinary research space for 1,000 scientists and engineers, in addition to 50 scalable units for university and industry spinouts and ventures.

Professor David Gann CBE, Vice President (Development & Innovation), said: "Imperial is here for the long-term, and Imperial West allows us to create space for our

future needs. Science, engineering, medicine and business are changing in ways we cannot fully exploit in South Kensington or on our other campuses. The extraordinary opportunity provided by the Research and Translation Hub will allow us to do so. Collaboration is our watchword. When academics, entrepreneurs and industrialists collide, co-locate and collaborate, innovation sparks. We are creating the space for this to happen. Our ambition is for Imperial West to become Europe's leading innovation district. As we break ground to construct this Hub, we start to realise this vision."

CivSoc International Tour



Yue Yang (4th Yr - Civ Eng)

On the 30th of March at 9:30 am, 68 Civil Engineers from the Department of Civil and Environmental Engineering took off to Budapest, the capital of Hungary, for the annual CivSoc International Tour. It was indeed an event that many had been looking forward to and the excitement amongst the participants was felt throughout the journey from the Imperial College Union to Budapest Airport.

Upon arriving in Budapest at about 4 pm, CivSoc made their way to Hostel GoodMo in the centre of the capital. This was to be CivSoc's home for the next four days. The accommodation was a pleasant, cosy, and family-like-atmosphere hostel with very affordable prices and group discounts. With many break out spaces and a spacious common room, it provided students with an excellent opportunity to socialise in the mornings and evenings after the eventful days.

Budapest University of Technology and Economics

The next day the students were given an opportunity to experience a real life Civil Engineering project, just outside Budapest. It turned out that the Civil Engineering project which we'd planned to see, had been completed just a few weeks before our arrival. Perhaps one of the reasons was upcoming general elections. Nevertheless, our friends from the Budapest University of Technology and Economics (BUTE) managed to arrange an equally fascinating site visit just outside the city at a tyre factory construction site. Mr Balint Hack from KÉSZ Consulting, the main contractor, introduced us to the site and went through the health and safety introduction. Next, he explained challenges which they had to overcome on site and shared his experience of working with an international client (the factory belongs to Hankook) and keeping to very tight deadlines. Furthermore, the

participants were given an in-depth technical explanation of the construction methods used and were provided with a thorough explanation of the difficult ground conditions on site. Finally, the students were brought into the site and were able to view first-hand how the factory was constructed. Unfortunately, due to the sensitivity of the project, we were not allowed to take any pictures while touring the site.

After lunch CivSoc was invited by the BUTE to visit and tour their campus. The tour of the campus included visiting their technical library and was followed by a visit to the Materials and Geotechnics labs. Here, the students were shown the different types of tests used. Some of these were familiar to the older years and helped to reinforce the knowledge gained at Imperial and introduce younger years to the tests used in the industry. In particular, the second year students had

an opportunity to use a Schmidt hammer to test the hardness of the rocks in preparation for the Geology Trip that takes place at the end of Year 2. This activity was followed by a technical lecture on the bridges of Budapest given by Prof. Laszlo Dunai. The passion and enthusiasm of Prof. Dunai inspired many of the students. We learnt that some of the Budapest bridges were inspired by the ones from the UK. The technical details of each of these and how they were constructed a hundred years ago, were explained. This presentation was supplemented by a technical part of the boat cruise on Day 3. The lecture was followed by a presentation given by Student Council from the Faculty of Civil Engineering (CivSoc equivalent). They shared their experiences of running a Civil Engineering Society in Budapest and explained the events which they run. This was reciprocated by Rachel Ribeiro, CivSoc Chair, who talked about our Society



Louisa Barzokas (3rd Yr - Civ Eng)

Schmidt hammer demonstrated by BUTE Phd Student

2014 – Budapest

and being a Civil Engineering student in London. This part of the day was very valuable because it gave us a lot of ideas for next year.

Walking around Budapest

The following day we had the opportunity to learn about the history and culture of Budapest and Hungary. This was achieved through organising a walking tour which took up the greater part of the day. The activity proved to be tiring, yet enjoyable and educationally stimulating. All 68 students left the hostel at 10:30 am to reach the meeting point which was the Parliament Building. The grandness and beauty of the structure gave the students a feel of the Hungarian architecture in the 19th century. The guides also told us a few words on the political system of Hungary across the centuries. From there, the tour guides led the group to cover most of Budapest. They explained the turmoil and adversity that the



Yue Yang (4th Yr. Civ.Eng)

city went through over the last century with turbulent events such as World War Two, the Soviet occupation and communism. Then, we moved towards the Inner City where CivSoc had an opportunity to view the great architecture of Budapest where most houses and buildings were built with a strong Romantic-style and Neo-Classical influence. Lastly, we had an opportunity to cross the river via the famous Chain Bridge to visit the Castle District on the Buda site of the city. There, CivSoc was able to experience the height and splendour of the Austro-Hungarian Empire and see the breath-taking view of Budapest. The day ended with a boat cruise which perfectly complemented the lecture given by Prof. Dunai. It helped us to see and put in context the things which Prof. Dunai talked about. The knowledge was reinforced by Prof. Dunai's assistant who pointed out characteristic features of the bridges from the Civil Engineering point of view.

A free day

For the final full day in Budapest the students were given a free and easy day where nothing was planned and the participants were allowed to visit attractions as they saw fit. Most of us took the opportunity to visit tourist attractions not yet covered by the walking tour such as the Széchenyi Thermal Bath, the Gellért hill and the Heroes' Square. Some others decided to explore Old Buda soaking in the atmosphere of a foreign culture and city. The flexibility of the day was received with positive feedback as each individual was not hindered by a set plan and could experience the broad attractions that Budapest had to offer according to their likes and dislikes.

Home again

Unfortunately, the final day of the Tour had now arrived and the group made their way to Budapest Airport for the bittersweet moment of returning to London. The CivSoc International Tour 2014 was a successful event and it achieved all the goals set out by the committee. Additionally, there were no serious issues that occurred. Everything went according to plan and the budget was followed. The tour was successful as it had provided the perfect balance between an educational visit and a relaxing experience. Not only did the Tour achieve its main goals for the event, allowing students to experience Civil Engineering in a foreign country, the students were also given the educational experience of history, culture and technical knowledge. Furthermore, the social aspect of the Tour was not left out and the students from all the years really came together and bonded very well. Moreover, the



Yue Yang (4th Yr. Civ.Eng)

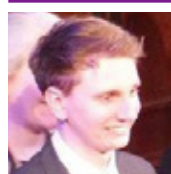
feedback received from the participants was very positive. It would not be farfetched to exclaim that all the participants were saddened with the end of the tour. However, all good things must come to an end. Nevertheless, the great success of this year's tour has built a definite excitement and enthusiasm for CivSoc International Tour 2015.

Thank you

The Tour would not have happened without the generous support from our partners. At this point I would like to thank BP, IC Union, the OC Trust (CGCA), CCC, Civil Engineering Department of Imperial College London and Vinci Construction. Thank you on behalf of all the students and I hope we can continue this cooperation in the future!



Yue Yang (4th Yr. Civ.Eng)



This report was written by Dominik Sznajder, a 4th year Civil Engineering student who is heavily involved in Civil Engineering Society (CivSoc). Last year, he was the International Tour Finance Officer and organised CivSoc's tour to Budapest. He was then elected to be the Chairman of CivSoc for the 2014-15 academic session.

Rio Tinto / Imperial education partnership

In 2012 Rio Tinto announced an education partnership with Imperial College in which it would support 12 students with scholarships in order to encourage engineering students to apply their skills in the mining sector. Students from 5 departments can apply and the successful candidates are selected at the end of their first year, receiving financial aid in years 2,3 and 4. As well as financial support the scholars receive help finding internships, mentoring from Rio Tinto staff, networking opportunities, and preferential entry into the Rio Tinto graduate programme. 12 Scholarships were awarded in 2012 and 2013 and will also be awarded in 2014 and 2015. Six of the current scholars have recently returned from their summer internships and have written about their experience and how it has changed their perception of mining and the practicalities of work.

“The Rio Tinto Education Partnership has the student experience at its core. The Partnership is multi-faceted, supporting not only those students that have scholarships, but also part-funding two Teaching Fellows and a geology field trip for all our students. This is a model for industry support of university education, and I am very proud the Faculty of Engineering is part of it.”

Professor Jan Cilliers FEng, Head of the Department of Earth Science and Engineering

Tobi Adewuyi (EEE) – Western Australia

“Do you know anything about the V-model?”

“No.”

“Do you have any experience in coding in C#?”

“No.”

“Do you know what a UML diagram is?”

“No?” I answered, for the final time.

At this point, I was expecting my project manager, Craig Rodgers, to follow up with, “Can you at least read and write?” Instead, he patiently walked me through the definition of the V-model, and thoroughly explained the details of the project I was going to be working on during my time in Perth. It was quite daunting at first; I was thrown into the deep end immediately, with little or no knowledge of the skills I needed to undertake the project.

I was tasked with the development of a desktop application to enable drill operators to record downtime events on autonomous drills. For example, if the GPS on an autonomous drill developed issues which led to the drill being unavailable for 2 hours, this event is defined as a downtime event and should be logged by the drill operator. Why is this information useful? Well, in mining, time is money. The total amount of time the Autonomous Drill System (ADS) is available for operation in a calendar year is critical to measuring how much value the system is delivering to Rio Tinto as a whole. Like every other large multinational organisation, Rio Tinto has specific Key Progress Indicators (KPIs) to act as a measure of how well the business is doing. These KPIs can further be broken down and specialised to address different areas of the business. In this case, the downtime events logged by the operators are used to generate specific KPIs to assess how much value the ADS is delivering to Rio Tinto. It is safe to say Sam Walsh will be very worried if he realises that the ADS operated for a mammoth 15 minutes in 2014.

My role was to oversee the life-cycle of the project, which included gathering requirements, designing the system architecture, implementing the documented requirements, and testing the final application. However, due to my limited time in Perth, I was only able to begin the early phases of the implementation but managed to pick up a host of valuable skills along the way.

The first step of my project was a requirements-gathering phase, where I had to speak to different key figures who were directly involved with the application. They conveyed to me what they expected the application to do, and I was responsible for effectively transforming their ideas into a written document that was easily readable and concise. This had a positive effect on my report-writing skills, communication skills, and the way I related with different people from various backgrounds.

Thereafter, I was then able to sit down with my project manager and discuss the system design of the project. This entailed the data flow of the system, how the data would be stored, and what language would be used to develop the application. Afterwards, I then created mock-ups for the graphical user interface of the application, which is a visual representation of how the application should look when the project is completed. Once the interface was approved by the concerned parties, I began implementation of the application. Interestingly, not all my time was spent at a desk, I also did a bit of site-seeing (pun intended), which really gave me an understanding of how the mining process works, the importance of technology in mining as a whole, and how my project fitted into the grand scheme of things.

Over the course of my internship, I completed a number of training courses that really altered my perspective on how I viewed safety in the workplace. In most cases, we never realise how important adhering to safety regulations are until we fall victim, and who better than to give safety advice than victims themselves? Safety is an extremely important area for Rio Tinto, and I was able to take away valuable safety skills. New regulations are continually being put in place to ensure everyone’s safety at Rio Tinto, as the company has taken a dynamic approach to safety and have not employed a one-size-fits-all system.

The experience was truly a fulfilling one, and one I will definitely never forget. As well as honing a catalogue of transferable skills, I now have experience in systems engineering, I have networked with a plethora of brilliant people, and also learned how to code in a new language. I am glad I was given the opportunity to intern 14,470 km from home, experiencing amazing Australian culture whilst working with the wonderful people in Technology and Innovation. From spending a considerable amount of time in deep thought trying to figure out why Australians had to stand on the left of escalators and not on the right like we do in London, to experiencing the thousands of acronyms in T&I (Technology and Innovation) who seemed to have acronyms for acronyms, I genuinely felt like every minute was absolutely worth it.



Georgina Bella-Taberno (Chem Eng) – Australia

I undertook an internship at the Rio Tinto Technology and Innovation Centre in Bundoora, Victoria for two months in the summer of 2014. As well as experiencing a new professional workplace, there was the added culture shock of visiting Australia for the first time! Thankfully everyone at the Bundoora Technological Development Centre (BTDC) was very welcoming, and I was able to make good friends through a host of work socials throughout my time there.



Unfortunately at Imperial College, the mining sector is often not discussed in depth as part of the Chemical Engineering degree. However this internship provided me with an insightful and unique exposure to the mining industry that cannot be achieved from textbooks or university courses.

My work explored current bioleaching processes used in Rio Tinto's copper projects; I was assigned an independent project with the view of preparing a scientific report as well as a verbal presentation to the team. My experimental work involved developing my current technical skills in a laboratory environment, which was a rewarding experience as an intern. The ability to apply a certain skill set to an unfamiliar environment is a key step towards becoming a more attractive and valuable employee.

Developing an independent project from start to finish was hugely gratifying. I learnt how to structure an experiment within a given time frame; communicate effectively to my Team Leader with informal progress updates, and the importance of liaising with peers to secure equipment or elemental assay results. Working for a multinational corporation has been enlightening and had a positive impact on my personal development. I am able to communicate ideas more succinctly, adjust my information to a wide range of audiences, and assimilate technical information more effectively.

As part of my training I was repeatedly exposed to Rio Tinto's zero harm safety culture, and it is one of the most important lessons that I will take away from this internship.

At the BTDC I was able to actively engage in safety interactions and Take 5's in my day-to-day routine. Becoming accustomed to a culture where safety is the main priority was a big change from university, but I enjoyed the opportunity to fully immerse myself in Rio Tinto's ethos and responsible approach to their ventures. At HSE meetings, staff and contractors would give a transparent account of recent hazards they had encountered, as well as resolutions to minimise injury and down time. Such an exercise is helpful not only to the speaker but to the audience; they are able to install safe guards and protocols to prevent similar accidents. Transparency and acceptance of responsibility amongst Rio Tinto personnel gave me an insight into their strong commitment to a zero harm culture. I hope to be able to educate my peers with an insight into Rio Tinto's safety objective on return to London.

I kept in regular contact with my mentor, Asuka Kagawa, through biweekly calls throughout my internship. Having a mentor who was both supportive and knowledgeable of Rio Tinto's many facets definitely improved my experience of the company. During our calls we would discuss my current work as well as broader topics such as Rio Tinto's sustainable development program; having the opportunity to learn about Rio Tinto's wider impact from a prominent member of the organisation was truly enlightening.

In my weekends I was able to explore everything that Victoria had to offer. I have seen the penguin parade under darkness at Philip Island, driven along the Great Ocean Road, fed kangaroos and played with dingo puppies! It is difficult to get a true understanding of a country after two months; Australia is an extremely diverse continent and I am thankful that I was able to see so much in my time here.

"A great opportunity to reflect on myself and my experience and to pass advice to a future star."

Lucy Ash, Mentor



Kimberley Mason (Geophysics) – Canada

In Montreal I worked for Rio Tinto Iron and Titanium (RTIT) as a Business Analyst Intern. Throughout my time there I supported an HR Business Partner and helped Business Improvement with current projects. The experience has given me a brilliant insight into Rio Tinto which I would not have otherwise been able to obtain. It has given me a clear idea as to what a role at Rio Tinto would be like and has definitely increased my interest in a job with them.

During the summer I learned how Rio Tinto operates on both a local and international scale. This includes how it communicates around the world and the effort put in to engage with communities from different cultures. I was given the opportunity to visit a smelter plant in Sorel which demonstrated how the theory of mineral processing which I am learning at Imperial is used within industry. The plant managers talked me through safety challenges that they face throughout operation and the processes in place to ensure maximum safety. I was lucky to get exposure to the management process and how a business strategy is created and propagated throughout each site. One of the most difficult aspects was wrapping my head around the size of the operations and the many factors that are considered when making decisions. A key benefit of the internship was that it improved my communication and presentation skills. Overall, my experience with RTIT was interesting and thoroughly enjoyable.

"Providing these internships provide tactical and strategic value to our business. We get access to a very capable student to help us with urgent projects, and their positive work experiences will help ensure Rio is an employer of choice for top graduates."

Tim Paterson, Supervisor



Tobi Adewuyi

Alice Pistolesi (Geophysics) – Gabon

This summer I spent seven weeks working with Rio Tinto Exploration on the Gabon project. Following a previous geological exploration survey which had reported high concentrations of heavy minerals, the aim of the project is to identify possible regions where Rio Tinto could develop an economically viable mine of titanium and associated minerals (zircon, rutile, ilmenite).



We worked on two different permits in the country: a first one near Port Gentil, south of the capital Libreville, and a second one east of it, in the primary forest in the Remboué district. The rest of the time was spent in Libreville, preparing for the following trip.

Having never had the opportunity before to go on “real” fieldwork and collect samples for potentially economic purposes, I truly enjoyed this experience in every way, and feel like I have learned a considerable amount in these seven weeks, from understanding how a mining company functions to day to day practical life in the field.

Work on the Port Gentil permit had already started long before my arrival and I was therefore able to understand not only the sampling procedures (using Auger drilling and bailing) but also the criteria and thought process used to evaluate the destiny of a permit. Indeed, as exciting as it got when the titanium concentration looked high in some of the samples, it was humbling to realise that the quantities needed to make a mine viable were far superior to what we could find as well. We flew by helicopter (which was definitely one of my best experiences during the internship, having never been in one before) to the permit site every day and would then “hop” between each hole location, drill the hole and record the findings before moving on to the next location. The recurrent safety briefings (before each flight in the helicopter) and risk assessments enabled me to understand the importance of doing them regularly, so that safety measures become instinctive rather than the result of a thought process. Something not necessarily obvious when we were working in clear savannahs but which became much more important in the Remboué where regular stops and ‘take 5’s had to be made to assess the safety of bridges and paths we had to use. The full emergency evacuation exercise we did whilst near Port Gentil was also very enlightening. And reassuring, as everything went well!

My experiences of the Remboué permit were very different to the Port Gentil one. This showed me that despite the proximity and the fact that the aim was identical in both permits, fieldwork itself is very unpredictable and unique. Indeed there I discovered proper 4x4 driving, hammocks and machetes. The forest was so dense that in my time there we mostly tried to identify which areas of the permit were accessible by car and where we would be likely to find any sand from which we could sample.

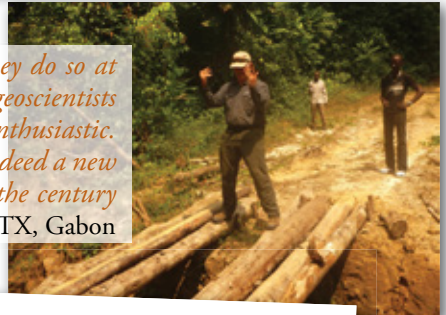
The contrast between Port Gentil where we only had to kneel down and clear some grass to collect a sample that would be a few meters deep and Remboué where we would drive for half a day before hiking our way through the forest in order to dig out some sand to a depth of a few tens of centimetres was drastic, and made my internship even more exciting and interesting by being so varied.

I also enjoyed spending time with the other members of the project as it enabled me to find out about their varied but all out of the common lifestyles.

Most importantly, this summer with Rio Tinto taught me that whatever the career, there is no degree that could ever prepare me fully for it and most of the learning is done outside the lecture hall.

“Many companies are cutting internships and graduate recruiting and they do so at their peril. The future of our industry depends on the next generation of geoscientists and engineers who are not only skilled and well trained, but also loyal and enthusiastic. This summer our two students have confirmed my conviction that there is indeed a new wave of employees who will be well prepared to take on the challenges of the century with humour, skill and intellect.”

Howard Golden, General Manager, RTX, Gabon



Alice Pistolesi

Harry Fisher (Geology) – Namibia

For the past 3 months I have gained a unique insight into exploration geology with the Namibia Projects team at RTX who are exploring for sedimentary-hosted copper mineralisation. In June this year, RTX were granted 3 Exclusive Prospecting Licenses (EPLs) in North Eastern Namibia, at the Western end of the Caprivi Strip. I have been involved with the project from the very early stages, gaining invaluable exposure to numerous aspects of exploration projects including preliminary desk-based research, HSEC and geological mapping.

Initially, at Paddington, I built a geodatabase to gather any relevant historic data with capacity for expansion as the project progresses. Using satellite imagery data, I then identified geological targets that could be tested during the mapping phase of early exploration. This region has very little pre-existing geological data which makes the project particularly challenging and exciting! As a result of this, the first phase in Namibia involves developing a comprehensive understanding of the regional geology through mapping. This will then be used to identify mineralisation zones and correlate the findings with the Central African Copper Belt in Zambia and the DRC. After overcoming some community engagement difficulties, I was involved in the initial stages of mapping; this work will continue later this year.

During my time with RTX, I realised that geology is only part of the work for an exploration geologist. The incorporation of HSEC into the project is also vital, particularly when based in remote and less developed areas of the world; exposure to this aspect of the industry was very interesting and I quickly realised HSEC is a responsibility of every employee. It was also a great opportunity to work alongside several RTX colleagues, from whom I learnt a great deal about broader aspects of the industry.

In addition to developing personal and professional skills, I relished the opportunity to live and work in Namibia, and do a different type of exploring in my time off! Getting a realistic taste of life as an exploration geologist with RTX increased my understanding of the role and the lifestyle that it involves. The entire experience has cemented my desire to pursue a career in exploration after graduating where I hope to further my understanding of all aspects of the mineral exploration industry.

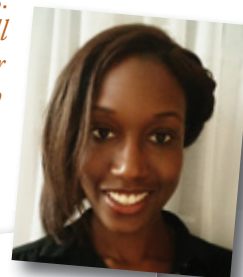
Quote from Henry Stratford, Namibia Projects Manager: “The ability for the business to meet, and assess, the future talent pool, as well as tomorrow’s talent to be able to experience industry and decide where best to form their career. It’s important that it is a positive relationship both ways - to benefit both the business and the individual”



Harry Fisher

'The geoscientists of the future working in exploration will be in a profession that requires a balance of strong technical and observational skills together with the ability to work closely with a wide range of colleagues and stakeholders involved in different aspects of a project, often in remote field locations. Ore Body Knowledge underpins the business and the only way that Rio Tinto can ensure that it will have access to high calibre geoscientists who will find the mines that will ensure continuing success for the Group and who have the enthusiasm to establish a career in Rio Tinto is to give them exposure to the people and environment that they will work in so that both Company and Graduates can make informed decisions as to their futures.'

Adam Duffin, Mentor



Zoë Pierre (Geophysics) – Botswana

I was taken on as a Student Geoscientist. I undertook exploration activities for Rio Tinto Exploration Africa/Europe for the Kokotsha Iron ore project in Botswana. This involved exposure to a range of data collection techniques including: magnetic surveys, gravity surveys, collecting (reverse circulation) drill hole samples, portable x-ray fluorescence scanning, down the hole well logging of diameter, density, gamma radiation, magnetic susceptibility, optical TV and acoustic TV.

Singling out the greatest benefit I received from this experience is difficult, but it transformed theoretical concepts learnt at College to practical skills. With this came a greater understanding and appreciation for the difficulties and limitations of the exploration process. For example, straight line paths chosen for field gravity and magnetic surveys are not always passable and ideal drill hole sites are not always available for drilling due to lack of consent from landowners. These seemingly simple obstacles are often overlooked in the survey design stage.

Furthermore, the internship has left me with a deeper understanding of all the different contributing elements to an exploration effort beyond the geology and geophysics. I refer to human resource management, health and safety policies and community engagement.

The greatest challenge was without doubt being isolated and restricted in movement for more than 6 weeks. The nearest town from the Kokotsha Camp was about two and a half hours drive away and the Capital city was about 5 and half hours drive away. Driving was restricted only to Rio Tinto certified drivers and vehicles were few. Given that, there was a feeling that there was never a switch off from work. The workplace and home were one and the same and I found that after about three weeks this was particularly wearisome. Furthermore, local employees generally spoke minimal English so I found it difficult at times to communicate but this improved with time as I learnt bits of the Setswana language and made use of non verbal communication.

Beyond the technical skills in data acquisition that this internship has afforded me, I have:

- o Experienced the health and safety culture of Rio Tinto
- o Developed transferable skills of time management, teamwork, self motivation and synthesizing
- o Developed a greater understanding of the role of Rio Tinto in the mining sector and the potential impact such large companies have on small, poor communities and/or within undeveloped countries.
- o Developed my networking skills in a professional manner. Contacts made have provided very specific feedback about their challenges faced and have offered advice the different roles available within the industry and on successful career development.
- o Developed my personal and professional skills. I was able to engage with all levels of staff. Beyond this, I benefited through observation of the management style of Project Manager, Ulf Westhof, who was able to command respect and yet maintain approachability as a leader thus facilitating a relaxed and productive work environment.

This internship made concepts that were previously abstract, real and thus triggered questions that had previously not occurred to me in the classroom setting and overall changed the way I viewed certain methods. For instance I had used a magnetometer before on a College field trip but this had been on an imaginary target so processing the data afterwards felt quite pointless. However, seeing the processed data that we had collected in the field at Kokotsha and tying it in with other information from the gravity survey and well log data really compounded the usefulness of the technique.

Additionally, this experience left me with a feeling that Rio Tinto as a company genuinely takes care of its staff at all levels. The inbuilt safety culture continues to be my greatest attraction to the company.



Zoë Pierre



Zoë Pierre

'Through her internship at the Botswana Iron Ore Project at the Kokotsha Camp, Zoe not only learned about but also contributed to the exploration effort. She got along very well with all levels of staff and fitted in exceptionally well with the field teams. She "bought" into the RTX standards, policies and The Way We Work. Thus, such internships are nurturing the interest of students in the mining industry while providing them with technical and professional skills. In so doing, we as a business are fostering the development of our future assets.'

Ulf Westhof, Project Manager, Kokotsha Camp, Zoë's supervisor

Bleeding Oil: Nigeria's Curse in Disguise

PhD Petroleum Engineering student, Tarik Saif, from Earth Science and Engineering, won the RSMA Essay prize with this article, highlighting the environmental impact of reckless oil extraction on communities in Nigeria's Niger Delta.

It is a scene that a Hollywood director would create for the end of the world, but this is not fiction. The stench of crude oil and rotting vegetation hangs densely in the air. The toxic smell circulates in your nose and within just a few minutes you begin to feel nauseous – this place has become a total wasteland. The delta of the Niger River is a vast maze of creeks and mangroves, but in half a century it has become the capital of oil slicks. There are no spill response vessels here, just a permanent reminder of the sloppiness in the extraction of crude oil.

Nigeria has one of the largest crude oil reserves worldwide. More than 80 percent of the nation's income is derived from the export of light oil, the best-quality crude in the world. Though revenues are substantial, so are the inequalities in the division of wealth. In a complex network of corruption, the notion of an oil curse increasingly seems to make sense. The people are poorer today in Nigeria than in the 1960s and the population of the Niger Delta has received a mere drop of the multi-billion dollar ocean that sits in their own backyard coupled with an excruciating environmental disaster.

In 1956, Shell drilled Nigeria's first oil well at Oloibiri in the state of Bayelsa, and since then more than 600 oilfields have been discovered in the Niger Delta. This has led to 7000 kilometres of pipelines which now crisscross the delta as they pass numerous villages where the indigenous people's livelihoods are heavily dependent on the diverse ecosystems of mangroves, fresh water swamps and rainforests. However, what is known to be the largest wetland in Africa has now become characterised by polluted streams and rivers covered in a sheen of greasy oil,

along with forests and farmlands smothered with toxic crude. In fact, more oil is spilled from the delta's network of terminals, pipes, pumping stations and oil platforms every year than has been lost in the BP oil spill in the Gulf of Mexico just four years ago. This cumulative catastrophe has led to millions of barrels of oil gushing into the delta over the past half century – more than 50 times the pollution unleashed in the Exxon Valdez tanker disaster

“I'm so angry at the people responsible for this, there used to be enough fish for everyone, but now there is hardly anything to catch here – almost all the fish are dead.”

in Alaska in 1989.

In Port Harcourt, the centre of the Niger Delta, oil seeps out of leaky pipes day and night, but here nobody is interested in international standards. Corruption and ignorance have led to the unparalleled destruction of the environment that greets you. The situation in the fishing village of Boru is especially dramatic as several oil leaks from the Trans Niger pipeline have poisoned the water and destroyed the livelihoods of fishermen like Akare Linus who speaks out: “I'm so angry

at the people responsible for this, there used to be enough fish for everyone, but now there is hardly anything to catch here anymore – almost all the fish are dead”. For many, there is no option but to keep fishing, although the flesh of the fish now tastes of kerosene. This area used to be a Valhalla for fishermen but the fish have almost disappeared as the environment has been recklessly destroyed. As you move along the crude-drenched waters, you meet Asami who has been fishing here for years and she has almost resigned herself to these permanent oil slicks: “Before, when we could fish, we just kept what we needed to eat and the rest was sold. With these oil spills, we cannot feed our families anymore; we're almost dying of hunger”. Waters that were once full of life with fish, crabs and prawns have now become lifeless. Without the ability to fish, the communities of thousands of villages, just like Boru, have become impoverished. The greatest scandal is that these people are still being left to deal with the oil pollution on their own.

In the state of Bayelsa, two hours drive from Boru, the scale of the disaster soon begins to dawn on you. Everything along the water and further inland has become blackened by the crude. It's quite something being here. Chief Emmanuel of the Ogbia community is with us to assess the damage caused by a recent oil leak coming out with full force for more than one month. For miles around, water is no longer drinkable and lands are unworkable, the landscape has been totally defaced and disfigured. Already mutilated by the installation of pipelines, the forest is now poisoned, as if a black plague has infected the environment. The water used by the local people for drinking, cooking and washing is



Gas flare

Leonid Ilean/shutterstock.com



Night image of the Niger Delta, showing the positions of numerous gas flares

NASA Earth Observatory

heavily polluted. In this community, families are drinking water from a well contaminated with benzene – a known carcinogen – at levels over 900 times the World Health Organization's guidelines. In another area, ten centimetres of oil floats on ground water that serves the local water wells. At one well, you begin to lower an empty bucket, then lift up the full container and are welcomed by shimmering oil on the surface of the water. On a journey to the coastal waterside with Chief Emmanuel, you witness the first signs of the disaster at the harbour, but the worst is yet to come. It is hard to believe that 10,000 fishermen worked here only four years ago. As you breathe, you sense the air becoming heavier as it catches your lungs and eyes, leaving you with a lingering headache. You cannot stay here for more than a couple of hours. The inhabitants of Ogbia are furious, as they are exposed to this pollution all the time, through air, water and soil. But it comes as no surprise to you as they begin to speak out on how the oil pollution has harmed their health and subjected them to what were once alien diseases. Life expectancy in this region is forty, 10 years below the country's average. Before the oil spills, this region was not used to cancerous diseases, but today they are rampant, along with chronic respiratory problems, and many people are now suffering from severe dysentery and diarrhoea as a result of drinking contaminated water. The Niger Delta has thousands of villages just like Ogbia where sanitary conditions are horrific and millions of people are being ignored.

As you move through the jungle, worrying figures appear from the haze at a bend in the river. In a secret glade behind a curtain of smoke, three men are engaged in strictly illegal activities. It is another Nigerian paradox: the nation is wealthy with crude oil, but the citizens have no fuel. At a temperature of more than 400 degrees Celsius, one of the men pours oil onto a fire. The thick clouds make it almost impossible to breathe. With the simplest of technology, these illegal refiners are able to supply fuel for a few dollars to transporters and the local community. But working in these conditions is life-threatening, here anything can explode or catch fire at any time. One of the men shows you his deep scars where burning oil from an explosion had

landed on his waist and where the burns are still purulent. However, what these refiners won't tell you is that the crude oil they retrieve comes from pipeline sabotage. Canoes used for siphoning oil to the illegal refinery are scattered along the creeks. They tap the crude oil secretly from the extensive pipeline system in the Niger Delta. Known locally as bunkerers, crude oil thieves have been a fact of life for years in Africa's biggest oil and gas industry, puncturing countless pipelines along the Niger Delta.

Approaching the Utorogu oil facility in Nigeria's southwest delta, a Nigerian child is silhouetted against a gas flare, one of more than 120 gas flares in the Niger Delta. A woman passes you by, carrying tapioca seeds, earlier set out to dry near a gas flare fire. Here, natural gas flares burn day and night as the oil industry burns off toxic gases, although this practice has been forbidden for almost 30 years. The 250 different toxins can cause cancer, asthma, chronic bronchitis, and blood

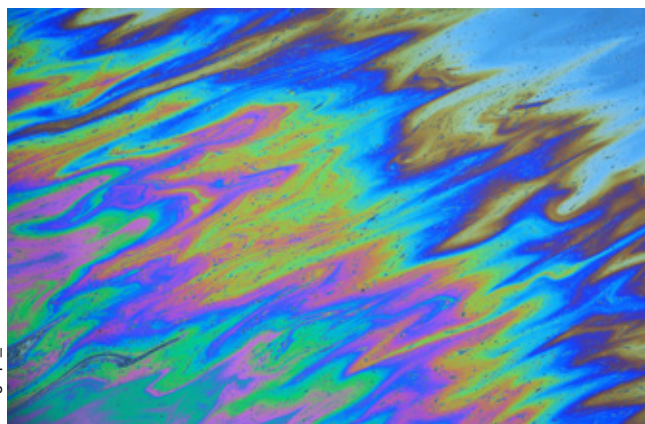
“The Niger Delta can be cleaned up, but it will cost more than \$1 billion and could take more than 30 years to restore the environment.”

disorders. The flares are so prevalent, the Niger Delta appears brightly lit in a NASA image of the Earth at night. Here, natural gas that bubbles up during oil extraction is burned. It's a cheap way of getting rid of an undesired by-product. Elsewhere, flaring has long been banned because it releases greenhouse gases and carcinogenic heavy metals. Flares, which continue for 24 hours a day in many areas, cause serious discomfort to people living near the flare sites. Flaring creates noise pollution and communities often have to live

with permanent light. Worse still, when gas is flared the combustion is often incomplete, so oil droplets fall on waterways, crops, houses and people. The gas could be recycled in an environmentally friendly manner, but the companies would have to invest in new technologies. Open gas flaring is cheaper, but it's more damaging to the world's climate and the local residents. In a nearby village, police and officials stand above a skeletal burned corpse lying on the ground next to a gas pipeline that detonated. Gas gushing from the ruptured pipeline exploded just a few days ago as villagers scavenged for free fuel, setting off an inferno that killed more than 200 people and left charred bodies scattered across the site. The scale of the damage inflicted on the people and their environment is mind-boggling. One man speaks out: “The people here are living corpses. You see them alive but they are dead inside”.

The Nigerian government and Shell say they're working on a plan to try and reverse the devastating impact of oil production on this region, but many people fear the environmental damage will only end when Nigeria's oil does. With more than one oil spill every day and over 50 years of pollution, the depth and seriousness of the contamination is severe. A number of factors have contributed to this environmental disaster: poor construction and maintenance, lax regulations, militant attacks, and petroleum thieves, not to mention government instability and abuse of power. According to a recent major UN report, the Niger Delta can be cleaned up, but it will cost more than \$1 billion and could take more than 30 years to restore the environment. As a bitter dispute rages over who is at fault, the devastation caused by the oil industry in Nigeria sadly persists and the pressure cooker of frustration continues to build.

The rainbow coloured reflections might spatter the waters of the Niger Delta for a long time to come; here nature and men are strongly bound together in a fight for survival. Without a fairer division of the oil income, without a renovated and healthy environment, the endless oil slicks will forever be feeding the bitter disappointment, anger and frustrations felt so strongly in this region of the world.



Rainbow coloured reflections spatter the waters of the Niger Delta



Tarik Saif is a PhD student at the Department of Earth Science and Engineering. His research focuses on the pore-scale analysis of unconventional oil and gas. Prior to joining Imperial, he studied Petroleum Engineering (MSc) at Heriot-Watt University, completing his undergraduate MEng degree with honours in Materials Engineering, Economics and Management from St. Catherine's College, Oxford. With current experience at Schlumberger, Tarik hopes to be amongst a new generation of young talent that will help meet the increasing energy demands of the future.

Making Drugs Today

Professor Sunil Shaunak is Professor of Infectious Diseases in Imperial's Faculty of Medicine, at Hammersmith Hospital. He presented a talk as part of the BBC Radio 4 series *Four Thought*, in which he addressed the idea of innovation and social capital from the perspective of pharmaceuticals. However his thought-provoking comments have a wider resonance throughout the sciences and perhaps especially in engineering where we strive to make commercial products. His talk was first broadcast on BBC Radio 4 on Wednesday 1 October 2014 (if you want to hear it you can download the podcast from the url at the end of this article). We are grateful to the BBC, and in particular Giles Edwards the producer of *Four Thought*, for allowing Sunil to publish the transcript of his talk in IE.

I've found that the hardest part of losing a patient was asking the family to return the left over drugs.

It was as a young doctor in the 1980s that I became involved in caring for some of the first HIV positive patients in Africa. For the poorest, this often meant sharing a hospital bed with somebody else. We examined the patients and made the diagnosis. We would even write up the prescriptions and we did all of this for free. But the patients had to buy their own pills.

Quite a shock when you come from the NHS.

It doesn't matter whether you're in Kenya or England or the US. Being black or poor or gay meant that the prejudice you already faced was compounded, many times over, by being sick with AIDS. Desperation for the drugs that delayed death, but were expensive, meant that many young people died.

There's one patient's memory, Mr Williams, that remains close to my heart. His trust in me was absolute. We worked together, often with dangerous drugs, to prolong his life.

He only asked me for a little more time so he could be with his partner in London.

When he died, I went to his funeral. His family told me that he had left me half his estate. "To do what with?" I asked. "As you wish", they said. "No rules – No restrictions". Imagine that.

So I set up the Williams Trust to fund work into affordable medicines for infections. Williams is dead but his charity lives on.

By 1988, I was working in a major US hospital on AIDS. When our patients died – they all died, everybody died of AIDS – I would ask the family to bring any leftover drugs back to the clinic. I wanted to covertly give them to those who were living but could not afford them. Officially, of course, this was forbidden. But my conscience meant that I was prepared to break rules relating to the disposal of unused drugs. It meant that treatment was often intermittent, but patients felt that something, anything, absolutely anything, was better than nothing.

It's the first time that I was exposed to the damage that a commercial monopoly in



medicines can do to healthcare.

Fast forward 10 years, and by 2000, there was a second and larger monopoly relating to the treatment of Hepatitis C. It meant that only a tiny fraction of the 170 million people worldwide could be treated and cured. This viral infection, if left untreated, leads to liver failure. But unlike the gay community, Hepatitis C infected patients didn't have the

power, or wealth, or influence, to bring their plight to the forefront of public attention.

Interferon, that's a naturally occurring protein, is the treatment for Hepatitis C. A large pharmaceutical company had a monopoly for adding sugar molecules (otherwise known as PEG) to the outside of interferon to make a new medicine called PEG-interferon. They set the cost of a year's treatment at £8,000. This commercial monopoly was great for

shareholders, but at what price to the social capital of the 90+% of Hepatitis C infected patients, many of whom were young – they could be your or my children – who could have been cured.

It was time to get creative. What could be done about this private monopoly?

After all, people in academia have a choice. They can use their creativity to make large sums of money for shareholders, or they can look out to the global community and make affordable medicines for everyone. We called this idea Ethical Pharmaceuticals. When it was born, it captured the public's imagination – I have to say, much to my surprise – and all across the world too. It became clear to me that there was immense frustration with the kind of corporate creativity that leads to a high price commercial monopoly in new medicines.

One can, of course, argue that AIDS and Hepatitis C, like Ebola, are all primarily infectious diseases of poor parts of the world, with little impact on our community and our country. But, as the world shrinks, and bugs move ever more rapidly, we face the ticking time bomb of antibiotics becoming ineffective. As Sally Davies, the Chief Medical Officer has said: "We could soon be back in the 19th Century with infections killing us again – and just after a routine operation too. A lot of our organ transplants and cancer treatments would have to stop because of the increased risk of infection."

David Cameron is worried. He's put the impending failure of antibiotics on the national risk register – alongside terrorism.

And let's not forget that WHO has declared Ebola an international public health emergency – it is, after all, the biggest outbreak in history. We don't have a vaccine or a cure because there's no money in it.

Ebola's actually very real for me. I'm on call for the hospital this week and we've already had two calls. They're all in the middle of the night. People landing at Heathrow. They've got a fever. They've got a cough. They're not well. Thankfully neither of them has been positive but we'll have to wait and see what the future holds.

And as if all this wasn't enough to be getting on with, the affordability of new medicines is back on the table. It's the two together – drugs for difficult diseases and their affordability – that makes for such a tricky problem today.

In recent days, we've seen the frustration of cancer patients with the decision of NICE to block the use of two new drugs. A breast cancer drug costing £90,000 a year and a prostate cancer drug costing £36,000 a year.

So, as a University Professor, I could have continued to sit in my ivory tower at Imperial College and think up great new ideas and write starchy academic papers, thanks to a public sector salary. Or, I could try to become an entrepreneur, one who turned his ideas into intellectual property, because life is all about

property today, that was filed as patents by Imperial, to try and make new products. In my case, as medicines.

As it happens, that's what I did when I created the biotech company Polytherics in 2001 which has just floated on the London Stock Market under its new name Abzena.

So my personal experience is unusual because it encompasses both sides of a coin of creativity. The first – thinking up new ideas – happened in the public sector. The second – making new products – happened in the private sector. Nothing was planned or co-ordinated about this experience; no pre-ordained project plan or those beloved Gantt charts. The experience has given me reason to reflect on the creativity of ideas and products, in both the public and private sectors.

Back in 2000, when affordability of drugs was also a hot topic, we asked how could we use our creativity to make a simpler and more cost-effective PEG-interferon for Hepatitis C? The pharmaceutical company's monopoly was based on adding sugar molecules to the outside of the interferon, via a bridge. Our light bulb moment was to put the bridge on the inside of the protein, and to connect the sugar molecules via that internal bridge.

We were told it couldn't be done without destroying the interferon. So roll on 5 years and 10 scientists to prove that the textbook's wrong. We published our results in Nature journals and were able to persuade Imperial to file a patent for the intellectual property.

So we had *achieved creativity and in the public sector*.

But what to do now?

We were keen on the idea of wanting to make cost effective medicines that broke the existing commercial monopoly. We tried really hard to achieve this. But we gradually came to realise that the process of commercialisation, to make new medicines, is driven by bankers with deep pockets. They're answerable to shareholders with an insatiable appetite for a large financial return. Those in the city that invest your and my pension funds, will only support and promote those medicinal products that generate high revenue streams.

Of course, this means that the financial rewards paid, to the likes of you, and me, enable us to carry on living very comfortably.

So my public creativity has led to a private enterprise and to new products that are medicines. This has increased our financial capital, but, I've come to believe, in the process, reduced our social capital.

In this country, we believed that our greatest social capital came from our exceptional ability – as the British – to think up new ideas. Turning these ideas into products that could be sold for profit was taken as given. Look at the quality and heritage of our great British companies – Rolls-Royce, Jaguar, Cadburys, Boots. But to my mind, our public, liberal and independent institutions are the greatest and most tangible manifestation of this concept of social capital. At its best, it encompasses our universities, the BBC, the NHS – I think a lot of us think that really really really is true – and the National Trust.

But over the last 20 years, a period during which I have been working as both an ideas man and a new products man, I think that something in our country has changed – with respect to our perceptions of the relative values and contributions of the public versus the private sector. Our primary measure and value of our social capital – as a community and a country – has moved incrementally towards those dreaded Excel spreadsheets, and those wonderful accountants and the annual financial report.

We are increasingly judging our community and our country with the one-dimensional measure of the share price and the dividend. I believe this is fundamentally undermining some of the most important principles on which the success of British society has been based over the last century.

So what's Mr Williams going to have to say about all of this?

He might chuckle, – and he might say – "Drugs for difficult diseases and their affordability – wasn't that also a problem when I died of AIDS? Are you really telling me Sunil that you're no further along in making such medicines today?"

He might also say that it was the gay community's social capital that made the biggest difference to changing AIDS from a terminal disease into a treatable disease, like diabetes.

He may even ask if we're waiting for a new pressure group to come along to drive forward the need for fresh ideas that will let social capital grow, in tandem, with profitable medicines.

After all, we want the richness of our society to grow. And for generations to come.

References:

- You can hear Sunil giving the talk on Four Thought by downloading the BBC podcast from <http://bit.ly/IE21-4Thought>

Professor Sunil Shaunak MD, PhD studied medicine in London, Edinburgh and at Duke University, and received his PhD from Imperial. He became a senior lecturer in 1991 and was awarded the first personal chair in infectious diseases at Imperial in 2004.

Over the last 25 years, his research has focused on the discovery and development of cost-effective new medicines for infection and inflammation.

Steam's Up at the Crossness 'Cathedral'

Would you choose to celebrate your birthday in a sewage pumping station? Maybe if it was a Victorian pumping station built as part of the solution to the Great Stink, you might reconsider. Especially if it was once dubbed the 'Crossness Cathedral'. This is how our production and design editor, Alison, recently spent her birthday. I went along for the ride...



"You know what I'd really like to do for my birthday this year?" Alison said a few weeks ago. It turned out to be a rhetorical question as she told me before I could hazard a guess. "I'd like to go to Crossness."

The name rang a bell in the depths of my memory but I couldn't immediately bring it to mind. I obviously looked quizzical, as she went on to explain that it is, or rather was, a sewage pumping station beside the Thames on Erith Marshes near what is now called Thamesmead. Slowly, recognition dawned on me. She had mentioned this place many years ago, had always wanted to visit but had not realised that there was now a real possibility. Within a couple of minutes she was showing me photos from the internet of this magnificent edifice. It was obviously fate that had decreed there should be an open day at Crossness on the weekend of her birthday. What's more, it wasn't just an open day, but a Steampunk Convivial! How could we not attend when the universe was clearly aligning itself for that purpose? To add to the fun, there was to be a guided walk from Abbey Wood station, through the ruins of Lesnes Abbey, along the verdant Abbey Way into the heart of Thamesmead and finally following the Ridgeway to Crossness. It was perhaps a little optimistic to expect the weather to be suitable at the end of September, but as it turned out it was a beautiful day (if anything too hot!).

Our walk finished at Crossness and we were surprised to find a queue of people waiting to enter the building. The site of Crossness is still a working sewage treatment plant operated by Thames Water, but the original Victorian pumping station is no longer in use. The engine house was largely abandoned and ignored from 1956, when the engines last operated, until 1985 when renovation



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What is Steampunk?

Simply put, Steampunk is a genre of speculative fiction based on the premise of an alternative history where modern technology such as computers, robots and transportation were developed in the 1800s and were powered by steam. The term was coined by science fiction author K.W.Jeter in 1987, although it achieved wider notice through the publication of *The Difference Engine* by William Gibson and Bruce Sterling in 1992. In fact,

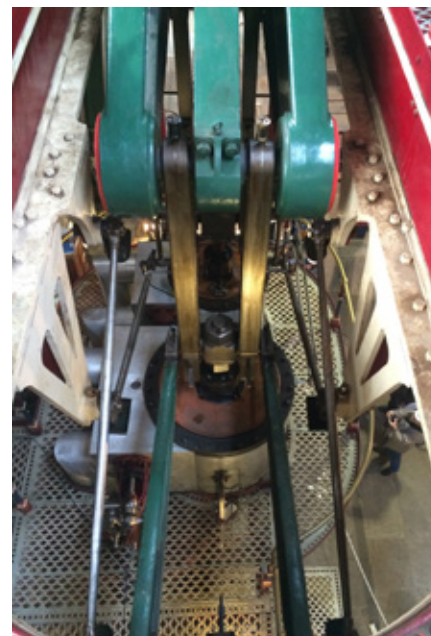
H.G.Wells (notable alumnus of RCS), Jules Verne and Mary Shelley can be considered to have been early exponents of the genre long before the name was coined. The recent increase in popularity of speculative fiction in general and steampunk in particular has led to the concept being adopted in various other media, in video games, art and fashion. When fans dress in character (known as cosplay) they often choose to wear a top hat with brass-rimmed goggles, and often spurious items of clockwork as additional adornment.



All Crossness photographs by Alison and Peter Buck



From the Boiler House we were encouraged to enter the Beam Engine House, coming first into an octagonal arcade of iron columns supporting the first floor gallery, having a decorative cast-iron frieze on all eight sides with cast-iron screens below on four sides. The other four sides lead to the engine halls to the east and west, the boiler room to the south and the triple expansion engine house to the north. Behind the northern screens are cast-iron stairways with brass handrails, leading up to the beam floor and the cylinder-head gallery. In the centre of the octagon, a spiral staircase leads down to one of the basements. It is the decoration of the octagon in particular which led to this being dubbed 'The Crossness Cathedral'. The East and West engine halls leading off the octagon each contain two beam engines, on the north and south sides, with a row of six cylindrical columns running across the ground floor of each hall supporting the beam fulcrums. In the west hall the engines are



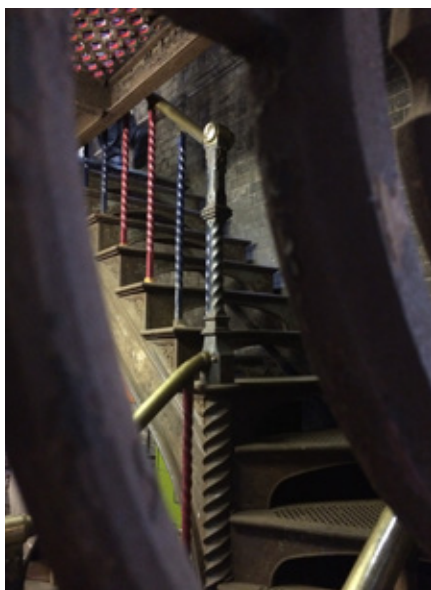
was begun. That renovation is still underway and events like the Crossness Engines Sewage Metropolis Steampunk Convivial and Guided Walk are ways in which the Crossness Engines Trust raise funds to pay for it.

When we were finally admitted we were welcomed by the sound of a live steampunk 'band' in what used to be the Boiler House. They were surrounded by a crowd of visitors dancing in a variety of costumes that certainly spanned the range of what is generally considered to constitute steampunk. We soon found ourselves in the midst of explorers in pith helmets, gentlemen (and gentlewomen) in top hats emblazoned with Biggles-style goggles, ladies in elaborate corsetry, army officers in splendid red jackets and more than a few fops and dandies. We felt decidedly underdressed.



engines that was in use until 1956. They were four of the largest beam engines ever built and are the largest surviving rotative beam engines in the country and probably in the world.

Due to the impressive number of visitors who had turned out for the Convivial, it was not considered safe enough to operate Prince Consort or allow visitors onto the Beam Floor or into the basements. However there are a few 'Steaming days' each year when visitors can get a better feel for the impressive operation of these behemoths. The last one for this year was on October 12th. If you're interested in visiting Crossness, details of Steaming Days and other events are available from the Trust's website [1]. The success of the Steampunk Convivial means it is likely to be repeated next year, details will appear on the Convivial's Facebook page.



called *Victoria* and *Prince Consort*, while in the east hall they are called *Alexandria* and *Albert Edward*. So far only *Prince Consort* has been restored, believed to have been the last of the

Steaming

The attraction of seeing one of these impressive engines actually operating was too much to resist so, two weeks later, we were back.

The Boiler House contains no boilers, as they were scrapped in 1957 once the engines were no longer in use and the room was turned into a canteen and workshops. Now it contains some exhibits relating to the history of Crossness and examples of small engines from other local sites.



FEATURES

The number of visitors appeared to be even greater than for the Steampunk Convivial, although this time there were very few people in victorian garb (apart from the operators) and plenty of Trust volunteers to ensure safety. As big as it had looked two weeks earlier when it was immobile, the beam of the Prince Consort engine seemed even more massive as it (apparently effortlessly) rocked back and forth in a surprisingly gentle and soothing rhythm. Nevertheless the immense power of the engine was quite palpable, even though it was far less noisy than I had expected – what's more, when standing on the Beam floor one could feel more vibration from the other visitors walking around than from the engine. Self-guided tours enabled visitors to look around the various levels of the Engine House: a basement where the air pump, water pump and condenser could be viewed; another basement where the high pressure cylinder, governor and sewage pumps were visible and a display showed how the sewage was pumped up through flap valves from the end of the 'Southern Outfall' where it had arrived by gravity from as far away as Putney, before being forced out into a culvert leading to the reservoir; the ground floor where the top of the massive flywheel was visible as were the intermediate and low-pressure cylinders and the valve gear; the beam floor where the beam itself could be seen. You can see for yourself in our video [2]. The names given to the four engines were highly appropriate as it was a truly majestic sight even seeing only one of them running. What must it have been like



when all four were in operation?

The day was organised by the Trust who are restoring the site and the engines, and manned by their volunteers (including a very popular tea-room and a small shop where a well produced booklet with copious colour photographs is available, as well as suitable souvenirs for younger visitors.

There remains a great deal of restoration work still to be done and the Trust are always looking for members to support their work and volunteers to help – I'm sure they would welcome Imperial Engineers with open arms! You can get in touch via their website [1].



References:

- [1] <http://www.crossness.org.uk>
- [2] We shot some video on our tour, which you can see at <http://bit.ly/IE21-Crossness>



Peter Buck (Computing '76-79) is an IT consultant and publisher. When he's not helping clients through Quality Assurance assessments, IT Security evaluations or Commercial Product Assurance, he's busy working with his wife Alison to publish speculative fiction under the Elsewhen Press imprint. Oh, and in between all of that, he's also editor of this illustrious magazine!

A brief history of Crossness

By the 1850s the River Thames had become an open sewer, as drains emptied directly into the river, leading to foul smells and driving those who could afford it to leave the city during the summer months. In the summer of 1858, one of the hottest on record, the smell became unbearable and the 'Great Stink' affected the Houses of Parliament even to the point of forcing MPs to leave the chamber at times. Finally investment was agreed and a project was instigated which would alleviate the sewage problem and remove the smell. As many of the newly formed water companies that were supplying water to homes in London were taking their water directly from the Thames, there would also be a consequent improvement in the quality of drinking water. The Metropolitan Board of Works was empowered to raise money to carry out the project under the leadership of Chief Engineer Sir Joseph Bazalgette. A sewage system was designed with a network of drains throughout London emptying into vast sewers made of brick and Portland cement. These were built so that gravity would ensure the sewage would run through the tunnels along both sides of the Thames towards the east, ending at Crossness on the south bank and Barking on the north. At Crossness the sewage was pumped into a covered reservoir where it was held until the ebb tide, at which point it was released into the river to be taken out to the North Sea.

Crossness was opened by HRH the Prince of Wales on the 4th April 1865. The building was designed by Charles H. Driver who was renowned for decorative cast-iron work. The contractor, William Webster, was also responsible for other major public works in London.

The Boiler House originally held 12 'Cornish' boilers, which were replaced by 10 'Lancashire' boilers in 1895. By 1914 additional boilers had been added. In 1956 the engines were taken out of use and the Boiler House was converted into workshops and a canteen.

The rotative beam engines are 21.6 metres long, 22.8 metres high, 5.9 metres wide and are believed to be the largest of their type in the world. The main beam is 13 metres long and weighs over 47 tonnes. The flywheel has a diameter of 8.5 metres and weighs over 52 tonnes. The original single-cylinder engines were built by James Watt & Co, Birmingham; they were converted into triple-expansion engines between 1900-01 by Benjamin Goodfellow from Cheshire.

Prince Consort was steamed again in 2003 and formally started by HRH the Prince of Wales in the same year.

The reservoir, which is still in use, covers an area of over 2.5 hectares with a capacity of over 113 million litres.

Leading the 'Connected Generation'

The world has seen an incredible increase in the capability of the Internet. This has resulted in a generation of young people with a key differentiating characteristic – they have grown up using the Internet and Communications technology from an early age. This group has been called the “Connected Generation” (Gen C) and all students graduating today are part of it. Denis Hicks told us about a cross-Europe study.

In 2014, the European Institute for Industrial Leadership (EUIL) completed an investigation into managing young technology graduates from the so-called ‘Connected Generation’. The study was sponsored by manufacturing companies from the Process Industry.

The problem was that recruitment and retention of young graduates was becoming problematic. In addition, current managers in these industries did not ‘understand’ their junior staff who, for their part, did not respond effectively to career development programmes. Some companies saw it as a critical issue because their business models depended on maintaining highly skilled professionals often needing over 10-15 years of experience.

In a series of 4 conferences held across Europe, over 120 senior industrialists, academics and young graduates debated how to attract, develop and motivate the “Connected Generation”. The aim was to identify the key issues involved and understand any best practices that could be shared.

Our main finding is that we are approaching a tipping point from the combination of three trends – the exponential increase in computing power, connectivity to the Internet and the miniaturisation of sensors.

Moore’s Law predicts the doubling of computer power every 18-24 months but, more importantly, we are now close to a point when readily available computers will have the same processing power as the human brain. The availability of such cheap computing power, with sensors and connectivity, will drive a new ‘industrial revolution’. Increasingly, powerful and cheap computers will perform tasks currently done by many entry level graduates and experienced professionals.

So, while many of our conference participants were worried about the lack of talented graduates entering Industry, it seems that the real issue is that companies are working on the elimination of professional roles and their replacement by increasingly powerful technology.

This leap forward in the capability of technology can be seen everywhere but the extent of the future impact is, we think, largely underestimated. Most participants could not imagine that the power and costs of using the technology are changing exponentially. As such, few organisations are considering this in the design of their structures and

career developments plans. Few students are considering the trend when choosing their careers. In reality, we expect disruption, as the impacts of these trends are arriving faster than most social, educational and work structures can evolve.

An obvious example is the booking of travel, where the best algorithms have almost eliminated travel agents and a few specialised companies dominate the Internet. It is almost pointless to train new travel agents. The same trend can be seen in many areas of industry where expertise can be collected and programmed. Throw in fast, mobile connectivity and advanced miniaturised sensors and even tasks like driving a car can be affordably automated within one generation. Where will it stop?

The nature of expertise and employment within companies will change. The likely outcome is that companies will start outsourcing many of their internal functions which previously they held to be ‘core’.

This will, of course, drive the creation of new industries but will also have unwelcome social impacts. In particular, we expect the concentration of expertise and, therefore, wealth into relatively few service providers. This will happen because accessibility of the services via the internet will be global. The ones using the best experts will write the best algorithms and competition will be limited by access to those few experts. It will be a classical Internet business model with a ‘Winner Takes All’ scenario.

We think that, growing up in this revolution, the Connected Generation will find fewer and fewer opportunities in traditional industries as entry level roles are automated. At the same time the Education System encourages the training of more and more graduates.

Many companies may welcome this excess of supply, but they are also less likely to find candidates with the experience profiles required for this new, complicated and rapidly changing world. They will need to identify the best and then strive to keep them.

In the middle of this is the Connected Generation with a unique set of talents that come from their adept use of the internet and mobile technologies. They are used to ‘the best content’ via the Internet. They can rapidly collect data and prior art, leaving more time for cognitive analysis. They have

seen the fate of ‘Baby Boomers’, ‘Gen Xs’ and ‘Ys’ and have modified their own expectations wanting more control of their own careers. Gen Cs expect rewarding and multiple career opportunities with multiple employers.

On the other hand, Gen C is probably less comfortable using inter-personal social skills, accepting responsibilities and working in isolation. They work in networks rather than hierarchies and tend to underestimate the significance of building experience and the time required to become effective at managing. They prefer continuous, timely feedback.

In short, Generation C can be difficult to manage.

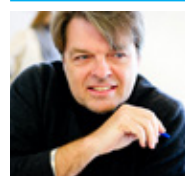
Companies will have no choice but to adopt technology and find the best recruits they can. However, they should change their approach for Gen C because they will need the ‘best of the best’ talent to prosper.

Before recruiting, companies should fundamentally review their corporate competences in the knowledge that some will be automated and outsourced.

To recruit the best of the best, companies need to be ‘cool’ when recruiting Gen C. They should identify inspirational role models and be open about their organisation’s values to be appealing as an employer. They should avoid excessively bureaucratic and anonymous recruitment processes with a poor website. They should offer varied careers rather than ‘structured career paths’. Recruitment campaigns should focus on targeted groups and they should work with educational institutions to develop pre-work education and training.

Retaining Gen C will be an increasing challenge unless companies embrace the balance of skills offered by Gen Cs and integrate them into their current teams. Companies should use modern IT platforms and Social Media tools that promote collaboration and retain corporate knowledge. They should foster networks rather than hierarchies. They should educate senior managers in the characteristics of Gen C, and train Gen C to efficiently and respectfully extract information from managers with ‘bi-directional coaching’ where managers and Gen C can exchange views. ‘Train to retain’ will help companies hang onto their best recruits.

For today’s graduates, the rate of change in the world of work will result in a very different future to the one most of us are expecting. A graduate would be wise to choose a career that no computer would aspire to.



Denis Hicks (Mech Eng 85) is an Advisory Director at the European Institute for Industrial Leadership – a non-profit management school based in Brussels. Financed by its member companies, it provides coaching and training for technical managers aspiring to a broader business role and it conducts studies into management issues at the request of its member companies.

The summary report ‘Leading the Connected Generation’ is available as an e-book from Smashwords at: <http://bit.ly/IE21-GenC>

DIARY

Friday, 28 November 2014**RSMA**

130th Annual Dinner
Venue: The Rembrandt Hotel,
11 Thurloe Place,
Knightsbridge,
London SW7 2RS.
19:00 for 20:00

Saturday, 29 November 2014**CGCA**

2014 Decade Reunion Luncheon
Venue: Polish Club Ognisko,
55 Exhibition Road.
12:30 for 13:00

Tuesday, 09 December 2014**CGCA**

Christmas Lunch
Venue: 170 Queen's Gate.
12 for 12:30

Friday, 20 March 2015**CGCA**

Annual Dinner
Venue: Stationers' Hall.
18:45 to 22:45

Thursday, 25 June 2015**RSMA**

AGM /Final Year BBQ
Venue: tbc

**For more information
or booking for
any events,
contact
Teresa Sergot
t.sergot@imperial.ac.uk
or phone
020 7594 1184**

ALUMNI NEWS & VIEWS

Who's doing what and where

Peter Harding Memorial Medal

The 2014 Peter Harding Memorial Medal has been awarded, by the RSMA committee, to Glynne Lloyd-Davies. Glynne was a member of the RSMA general committee from 1994 to 2012 and secretary of the RSMA Trust since 2000. As such Glynne has been a backbone of the RSMA over many years, providing wise and consistent counsel.

Glynne read mining geology at the RSM from 1961 to 1963 though claims he spent too much time (obviously productive) chasing his future wife! (Royal School of

Matchmaking?) He joined General Mining's London office as a secretarial assistant and qualified as a chartered secretary. In 1968 he joined Rio Tinto and spent the next 30 years with them, latterly as assistant secretary. For Glynne, life with Rio Tinto was varied and always interesting and this time cemented his affection for the mining industry. At various times he was involved with Rio's European exploration group, North Sea oil and gas, finance raising, the review of company law, exchange control and public offers

in Zimbabwe.

Part of his time, whilst at Rio Tinto, included involvement in the wider industry matters. He was secretary of The Minerals Industry Educational Trust and also The Mining Association of the UK and he worked with the Parliamentary All-Party Minerals Group and was a member of the CBI minerals committee.

He has been a tremendous servant of the RSM and RSMA over many years and is a truly deserving recipient of the medal award.

Imperial College Alumni Mentoring Scheme

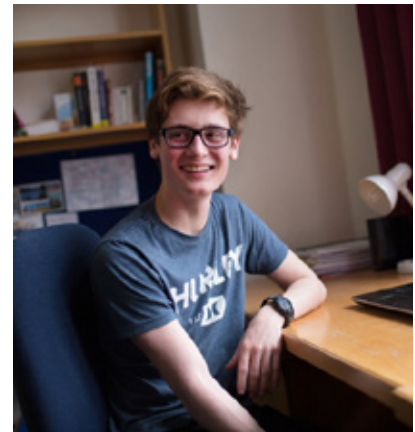
The Imperial College Careers Service is excited to launch a new Alumni Mentoring Scheme and is looking for mentors to take part. Becoming a mentor provides a great opportunity to promote your work and the sector as a whole to motivated Imperial students as well as a chance to use and develop mentoring and coaching skills which may be useful in your career.

Through the scheme we hope that mentors will develop Imperial students' knowledge of the professional workplace and

potential careers while sharing their professional experiences, personal insights and employability advice with students.

For further information please either contact the mentoring team on mentoring@imperial.ac.uk or visit the mentoring website - www.imperial.ac.uk/careers/mentor.

To take part there is a short application form available on the website.



Imperial College, London



Imperial College, London

Stay Connected - Make the most of being an Imperial alumnus

As a member of the RSMA / CGCA, you're also a member of the Imperial alumni community, a lifelong community of over 170,000 alumni across the globe. Make the most of this network by staying in touch with the College, taking advantage of exclusive alumni benefits and joining our online networks.

Top five ways to stay connected:

1. Register for exclusive alumni benefits

Membership is lifelong and free. Registering ensures you'll get to hear about the latest alumni events and networking opportunities. In addition, you'll receive our award-winning Imperial magazine and have access to the Central Library and Careers Service.

2. Activate your alumni email address

Display your Imperial connection with a free alumni email address ending in @alumni.imperial.ac.uk. Easy to set-up and manage, the email service includes calendar and chat functionality

3. Relax in the Alumni Visitor Centre

Visit the dedicated alumni lounge and meeting space at the main entrance of the South Kensington Campus. Facilities include free Wi-Fi, complimentary refreshments, a meeting room, newspapers and magazines, and a daytime left luggage area.

4. Join an alumni group or association

Imperial's global network of more than 50 alumni groups and associations will be delighted to welcome you. Meet alumni with similar interests and backgrounds, make professional connections and attend a range of events.

5. Join the community online

Network with more than 11,000 fellow alumni by becoming a member of Imperial's dedicated alumni group on LinkedIn. You can also keep up to date with the latest alumni news and events by following Imperial's alumni page on Facebook.

www.imperial.ac.uk/alumni



Imperial College, London



Imperial College, London



Imperial College, London

Imperial Alumni event 2014 - Metallurgy Class of 1966 reunion

The Imperial College alumni event, of the Metallurgy Class of 1966 on May 10, saw eight members (graduation year) meeting up, some



RSMA stand at the alumni event

for the first time since departing RSM. Remarkably, they were all recognisable. (?)

The plan is now to have a reunion of the class in 2016, to celebrate the 50th anniversary, and, in the interim, efforts will be made to contact as many members as possible.



Class of '66

(L to R) Martin Brooks, Mike Humphris, Andy Feest, Dick Adams, Paul Randall, John Skevington (Front) John O'Reilly, Doug Roberts

Some Musings from Canada

I have been employed in the western Canada oil and gas industry for over six years now, and continue to be painfully aware of the sensitive issues we face daily in regards to the disproportionately high levels of energy consumed and environmental tribulations associated with the recovery of the region's unconventional resources.

Some of our readers will be more familiar with these challenges that I am, having scant technical appreciation of the geological uniqueness of this location and the chemical processes concocted for extraction of the hydrocarbons when compared with other sources of fossil fuels.

I wonder if South Kensington's best brains have been deployed in any significant number in tackling the challenges in recovering this highly valuable and plentiful source of energy, in a politically secure and, by and large, humanitarian part of the world, for generations to come.

J Malcolm Gray (EE 83-86)

WE WANT YOUR NEWS

Let us know your news or stories

Contact Teresa Sergot (address and deadlines on page two)

In Memoriam – John Stollery

Having read the obituary for John Stollery in our Spring 2014 edition, Professor Nigel Wood sent us the following notes that he had composed on first hearing of Professor Stollery's death.

I was saddened to read of John's death in the August 2013 edition of Aerospace, and I wanted to find a way of marking his passing. I'd always admired John and thought I should write about his several influences on my career.

I first met John when I was an undergraduate in the Imperial College Aeronautics Department; he was my tutor from my 2nd year in 1957. (There was no 1st year course in Aeronautics in those days, which was frustrating!) John was a kindly and friendly tutor, always helpful. Moreover, I particularly enjoyed his lectures on aircraft stability and control. Of course, as an undergraduate, I assumed that this was his research area. I think this was strengthened by knowing that John had started his career in the de Havilland Aerodynamics Department. I'd attended a summer course at DH, where I was offered a place in the Aerodynamics Department to work on the Trident. Given the Trident's subsequent history, I guess that could have been frustrating. I also remember him advising me when I asked about a summer placement at the NLL (now NLR) in Amsterdam. It turned out that he'd also had a summer placement there when he was an undergraduate, and strongly recommended it – good advice, as it turned out!

It was only when I started work, having chosen to pursue research on hypersonic aerodynamics at Fort Halstead, that I learned that this was also John's research area (I'd also written two reports on design studies for a hypersonic tunnel at the NLL). As a result, I met John frequently, and I did a research-based MSc(Eng) under his guidance. Moreover, the design and major parts of John's hypersonic gun tunnel, still in the Aeronautics Department to this day, came from Fort Halstead, where the gun tunnel originated. I worked on two of the three gun tunnels at Fort Halstead, both investigating the free piston compression behaviour on the No 1 pilot tunnel and, subsequently, carrying out aerodynamic and heat transfer investigations in the large (No. 3) tunnel at Mach numbers between 8 and 13. I also worked on army transonic/supersonic missile problems, including a stability analysis on an army missile – my report was still in use at Fort Halstead when I visited nearly 30 years later, a legacy of John's lectures!

One of the problems in hypersonics of blunt bodies was its mixed nature between subsonic and supersonic flow, governed by hyperbolic equations which were tractable in unsteady, but not in steady flow. When computational time marching was invented I couldn't have been the only one to wonder why I hadn't thought of it! It could have led to

a good PhD in the Aero Dept.!

After I'd spent 8 years in hypersonics, John became aware of my interest in moving to a new field, possibly involving something to do with physiological or medical fluid dynamics. After I'd investigated one or two leads, John told me about the new Physiological Flow Studies Unit (PFSU), which was becoming established in the Aero Department, under the direction of a medical doctor, Colin Caro, now an Emeritus Professor in the Bioengineering Department, of which the PFSU became a founding group. Through John, I obtained an interview with Colin and was accepted as a Research Assistant in the Unit, leading to a PhD. Thus, John was instrumental in starting me off in the field, which is also my present biomedical activity.

A unique feature of PFSU at that time was having medics and engineers or physical scientists working together. I was fortunate in being paired with Tony Seed (now Professor Emeritus), who was an ideal partner, in research and teaching; in fact, we taught each other: physiology and medicine versus fluid dynamics. We were both able to earn PhDs from our collaboration. We were the first to observe transitional and turbulent flow in the circulation via a hot film velocity probe – a Eureka moment!

Subsequently I worked in the power generation industry, but early retirement once more brought me into contact with John at Cranfield, when I had a contract as SERC Aerospace Coordinator during my consultancy practice. This I ran whilst re-establishing myself in biomedical engineering, pioneering the combination of medical imaging with computational fluid dynamics, now a major field, known as image-based computational modelling. My success in re-establishing myself, and my continuing activity, in biomedical engineering is for me, another of John's legacies.

I last met John at an Aero Department reunion during the college's centenary year, 2007. He'd aged since I'd last met him in 1994, but there was still something of the old John about him.

I'm sure he'll be missed by all who knew him.

Professor Nigel Wood CEng, FRAeS, FIMechE,
Honorary Professorial Research Fellow, Biomedical Engineering,
Department of Chemical Engineering, Imperial College London
(Aero 56-59; PFSU 67-70)

Reminiscences of Chem. Eng. 1948 – 51

Reading the obituaries in our Spring 2014 edition, David Fowler noticed one in particular, that of David Price, which struck a chord. The two had worked quite closely together, with Michael Ewbank and Bill Blackett, on their final design project in their third year. This started him thinking about his years at College and wondering what had happened to some of his fellow students. He wrote the following reminiscences of his time at Imperial.

The Chemical Engineering program at that time was a three year course (if you had been exempted from the first year, which most people had), during which we spent the first year at RCS in the Chemistry Department doing Physical Chemistry with a smattering of Electrochemistry and Organic leavened by Engineering Drawing and Workshop in the C & G basement.

The Engineering Drawing turned out to be useful in later life, but Workshop was sheer torture for me. The second year was spent in the Mechanical Engineering Department at Guilds, learning the basics of engineering and, in the third year, we got down to the serious business of Chemical Engineering which I found thoroughly enjoyable.

Chemical Engineering was a small program with only 30 students entering their first year. 1948 seems to have been something of a post-war transition year in that a significant number of students were accepted straight out of school. As a result about 40% of the class were school-leavers and 60% were ex-servicemen. Of the latter, about half had seen active service, while the other half had simply completed their National Service. Despite the fact that the ex-service group were not a wholly cohesive group there was, nonetheless, initially an element of superiority exhibited by the ex-service cohort.

Of the original 30 class members 20 ultimately graduated. Eight, were eliminated after first year, one dropped out at the end of second year and one did not make the final cut. Of the graduates, four received a First, 12 received a Second and four received a Third or Pass degree. The ratio of ex-servicemen in the graduating class was very much the same as in the original class.

As a passing note, at the beginning I felt at a distinct disadvantage as I was not only a school-leaver but also I had been born and educated in Argentina. As a foreigner I did not fit naturally into either group but this situation did not persist. Because I looked and sounded like everyone else I was gradually accepted.

It has since struck me that other students in IC in these particular years had a similar experience in that there were two very different groups, ex-servicemen and school-leavers, and within each group many different backgrounds.

Among the ex-service group their ranks varied from privates, corporals and sergeants to commissioned officers, including two majors and one lieutenant-commander. The school-leavers also had varied backgrounds. All were thrust together for lab work and other projects.

Luckily in Chem. Eng. we were a small class, so separate cliques did not form. As a result, as time went by, there was more and more interaction and communication to everyone's benefit. It became evident to us (the school boys) that the ex-servicemen knew a great deal more about the world and practical matters than we did and that we could learn from them. On the other hand, the ex-service types could get help understanding theory and academic concepts from us. It was here that I realized that students can learn at least as much from their colleagues as they do from their formal lectures. It was a symbiotic relationship that worked to everyone's advantage.

I am grateful that I had an opportunity to be a part of that class.

David J Fowler (Chem Eng 48-51)

Formidable reputation as gifted engineer

ALBERT THOMAS JACKSON (Mech Eng 51-55)

Albert Jackson was born on May 22, 1931, and studied Mechanical Engineering 1951 - 55. On graduation, he very quickly obtained a job with Rolls Royce in Derby, where he worked until his retirement in 1991. By this time he had acquired a formidable reputation as a gifted engineer, due

in no small part to the quality of the education he had received at City & Guilds College.

His initial project at Rolls Royce was with the Dart turboprop engine. He moved in 1965 onto the Adour jet engine, then in 1978 he transferred to the High Temperature Demonstration Unit, working right up to 1991.

Albert died on January 17, 2012.

Engineer, historian and athlete

DAVID HENRY THOMAS HAMMONDS (Civil Eng 58-61)

David was born in Machynlleth, Wales on 04 May, 1940. He graduated in 1962 and worked as a geotechnical contract engineer in many countries around the world, initially with major UK, American and Canadian consultancy firms and latterly as an independent expert.

With his family, he moved from the UK to Montreal in 1974. He continued his career and was latterly involved as a specialist advisor on the Sendje hydroelectric project in Equatorial Guinea. Recently he lived in Merrickville, Ontario where he was an active member of the local Historical Society managing the Blockhouse Museum with his wife, Gillian, and was President of The Friends of the Merrickville Turbine. He was a keen middle distance athlete and cyclist throughout his life and was interested in every aspect of local and world politics.

Beloved husband, father and grandfather, David died on 10 September 2013, aged 73.

A much respected colleague

ANDREW KENNETH ABBIE (Mech Eng 64-67)

Born in 1945, Andy Abbie died in 2012, after a long illness.

Andy graduated from Imperial College, in 1967 with a first-class Honours Degree in Mechanical Engineering and worked as a production engineer with a major British manufacturer of electrical products. He entered the patent profession in private practice in 1970, qualifying in 1974. By this time he had gained first-hand industrial experience of workshop techniques as well as works, manufacturing and production engineering.

Over the course of his career he worked for household names and earned the respect of his peers for his experience and expertise in patent validity and infringement matters, industrial design and copyright. Illness forced his early retirement in 2003, but his humour and strength of character left a deep impression and he will be sorely missed. He leaves his wife Lorna and children Nicola, Paul and Tara.

Investigator for Lloyd's Register of Shipping

BRYAN HILDREW, (Mech Eng 46-48 MSc, DIC)



Bryan Hildrew was born in Sunderland, on March 19, 1920. He was educated at Bede Collegiate Boys School, and at

Technical College.

After leaving school, he entered into a five year apprenticeship with the North Eastern Marine Engine Works, Sunderland. He began his apprenticeship at the time of the 1930s recession, and believed that his willingness to play football for the company significantly improved his job prospects!

He attended Sunderland Technical College, initially in the evenings, and later full time, and studied for an external degree at London University. On the completion of his apprenticeship, he joined the Royal Navy as an Engineer Office. He spent the next five years in sea-going appointments.

In 1946, he returned to England, and studied for a Master's degree at City and Guilds College under Professor, later Sir Owen Saunders. His research subject was the determination of the flow of heat into large turbine rotors.

After completing his degree, in 1948, he joined Lloyd's Register of Shipping. For eight years he travelled the world carrying out field investigations into failures in ships and their machinery, and into measuring the static and dynamic strain in heavy industrial engineering plant and structures.

In 1957, Hildrew was seconded to the nuclear submarine project team, first at Harwell and then at Bath.

Upon his return to Lloyd's Register, he established the computer department. He was made Chief Engineer Surveyor in 1967 and Technical Director in 1970.

He was President of the Institution of Mechanical Engineers in 1980, and President of the Institute of Marine Engineers from 1983 to 1985. He was also Chairman of the Council of Engineering Institutions from 1981 to 1982.

Bryan died on January 11, 2012, aged 91 years.

Wide ranging interests



JOHN MICHAEL SHANAHAN (Civil Eng 58-61)

John was born on December 22, 1940 and grew up in Lambeth. He went to Alleyn's in September, 1952.

In 1961, he graduated from Imperial with a degree in engineering, and was recruited by Dexion a leading manufacturer of shelving systems. The company started a marketing & advertising department, which John ran for a year before leaving to start his own advertising agency.

In the 60s it was unheard of for young men to start their own businesses at 22, but this was the beginning of John Shanahan Associates – a PR and advertising agency which John built up and ran for the next 50 years. He could not

only write a good ad or brochure but he made friends of his clients so both sides benefitted.

John was a man with wide-ranging interests. His first love was probably music. He also loved books, art, concerts, theatre and cinema. In his 60's he grew interested in cooking and became a very proficient and innovative chef.

His other great interest was rugby. He joined Cobham Rugby Club and quickly rose up the ladder at the club. In 1995 he became Chairman, a post he held until 2005. After he retired he was made a Life President of the club. At his funeral, the now president of the club referred to John as 'the heartbeat of the club'.

One of the most impressive things about John was the way he spent the last 14 months of his life. Having been given just a few months to live he was determined to get the most out of every day. Despite the pain he suffered, with typical bravery, he and his partner, Caroline, pursued everything he enjoyed - trips abroad, the theatre, concerts, art museums, rugby matches etc., many commenting that he had done more in those 14 months than most had in a lifetime.

He died on December 7, 2013, at the age of 72, surrounded by his children, Caroline and her children.

A natural mentor to new lecturers

DONALD MACDONALD (Elec Eng 51-56)



Born on March 17, 1933, Donald, a lecturer and researcher in electrical machines and power systems, died on May 1, 2013, aged 80.

After graduating from Imperial, Donald was a graduate apprentice at BTH (British Thompson-Houston, later part of GEC) in Rugby, and worked there after graduation on large electrical generators.

He later returned to Imperial

College as a lecturer and gave many years of dedicated service through teaching and research in the fields of electrical machines and power systems. He specialised in the study of dynamic phenomena and stability of turbine alternators in AC transmission systems.

In later years, he gave invaluable service to the Department of Electrical and Electronic Engineering as its admissions tutor from 1995 until his retirement in 2005.

His good humour and friendly disposition will be fondly remembered across the university. He was a natural mentor to new lecturers, a role he voluntarily continued beyond his retirement, and his softly spoken words of advice on a range of topics were much appreciated.

He spent the last years of his life caring for his wife Valerie, who died in 2012 and he is survived by his four children.

Donald was a life member of CGCA.

The inspiration and instigator of the 'Party Technology' research group

BRIAN JAMES BRISCOE, Professor Emeritus, FRIC, FIChemE, FIPhys, FIM, FCGI (Chem Eng Staff 84 -14)

Professor Brian Briscoe died on the June 6, 2013, after a long, and at times painful battle against cancer. Brian served on the staff of the Chemical Engineering Department from 1984 until his retirement, and subsequently continued research as an honorary senior research fellow.

Born on January 11, 1945, he grew up in Wakefield in the then West Riding of Yorkshire, before studying for a BSc and PhD in Chemistry at the University of Hull. For his PhD, he studied the role of alcohols on the surface interfacial tension at the oil-water interface. He then moved to Cambridge, where he gained an MA, and was the Assistant Director of Research/ Ernst Oppenheimer Fellow in the Cavendish Laboratory from 1970 to 1978. Here he became interested in the problems of Friction and Lubrication (tribology), specifically in relation to polymers - topics which Brian remained interested in for the rest of his life.

From 1978-84, he lectured at the University of Cambridge, and later became a DSc(Eng) at Imperial.

He took up a post in the Chemical Engineering Department at Imperial, as Reader in Interface Science, becoming Professor of Interface Engineering in 1992.

From 1998-03, he was Director of Postgraduate Studies for the Department. A life member of the City & Guilds College Association, he was Dean of the City & Guilds College, from 1997-2000, sitting on the OC Trust Board and participating in trips with the students on Bo in

the London-Brighton run.

Brian's professional interests lay mainly in the field of solid-solid interactions, particularly where organic polymers formed one of the solid bodies. In particular, he was interested in those factors which were responsible for the friction, adhesion and wear of organic materials. He was one of the first to recognise the role of tribology in powder compaction, applying this initially to ceramics and more recently to pharmaceuticals.

Brian led or contributed to many learned papers and journal articles, and was also a contributor to chapters on polymer processing in two books.

He also received many awards for his research including the Sir George Beilby Medal in 1983, the tribology silver medal of the Institution of Mechanical Engineers the Royal Society of Chemistry interdisciplinary medal in 1988, and the Society of Chemical Industry (SCI) Founders Lecture in 1993.

His close colleague and friend, Professor Paul Luckham, wrote: "On the outside Brian seemed a typical blunt Yorkshireman... but Brian was greatly loved and admired by his PhD students and post docs. Brian did his best to create a family atmosphere around his research group which became known officially as Particle Technology and unofficially as 'Party Technology', reflecting the numerous birthdays and other events which were celebrated throughout the year."

Brian is survived by Mary, his wife of more than forty years, his children and six grand children.

Clever and conscientious engineer

JAMES HAASE (Civil Eng and Surveying 1945, DIC 1946)

Jim was born on August 15, 1923. Having escaped to England when the Russians invaded Latvia, Jim completed his schooling at Dulwich College and then City and Guilds Civil Engineering Department from 1943-46. He graduated with Honours and went on to attain a DIC. He was awarded full colours for fencing and was a member of the Links Club. He was a life member of CGCA.

He joined Christiani and Nielsen Civil Engineering Contractors in South Africa and supervised a number of CE contracts including a large Cement plant. He then

moved to Montreal and continued working for Christiani and Nielsen, designing and building major marine works in the Saint Lawrence river and a timber and paper mill in the Northern part of Quebec.

Late in the 1970's, Jim set up a consulting practice in Cornerbrook, Newfoundland and operated world wide, mainly on marine works.

Sadly, his wife Annaliese died in 1983 after a long illness and Jim returned to the UK, settling in Dorset. His eyesight became progressively worse and he returned to Canada and into the care of his family and died in late 2012.

A good friend and a clever and conscientious engineer.

The driving force behind a reenergized department



PETER NOEL ROWE (Chem Eng 49-52 DIC, PhD), FEng, FIChemE

Professor Peter Rowe was born on Christmas Day 1919 in Preston. Educated at Preston Grammar School, he was then employed as a technician and served in the RAF from 1940-46. During the war, he began his formal engineering training with a part-time HNC in mechanical engineering at Liverpool Technical College. After the war, he moved on to Manchester College of Technology to study chemical engineering from 1946-49.

Peter then moved to London, to study for a PhD on supersonic flow through rocket nozzles, at Imperial. His research, supported by the Ministry of Supply, continued till 1958. This period was critical in his development. He met his wife-to-be Pauline at Imperial and married in 1952.

He was appointed principal scientific officer at Harwell's Atomic Energy Research Establishment. Finally, he was working in mainstream chemical engineering in gas fluidisation, a technique critical in the enrichment of uranium from uranium dioxide. His experiments showing the role played by bubbles in such beds with a paper in Nature in 1960; and later produced over 30 publications on his Harwell work.

In 1965, Peter was appointed as Ramsay memorial professor of chemical engineering and head of department at University College London. He was an inspired choice. The department was going through difficult times and he seemed to sense what was needed to turn it around.

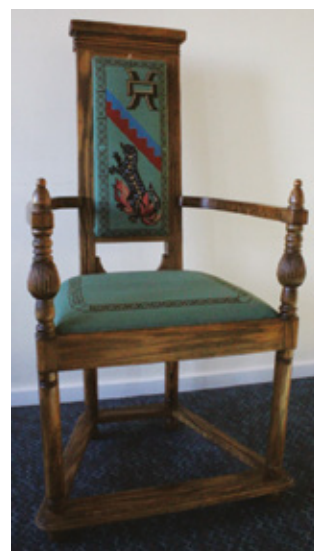
During his time at UCL, new courses were introduced, a flourishing tutorial system was established and social occasions

arranged to allow academic and support staff, students and the many research workers, to come together as an academic community. Peter was passionate about wine, organising tasting sessions to again bring together students and their tutors. He encouraged staff to be outward-looking, attend conferences and collaborate in Europe and further afield. He was himself invited to lecture around the world, up until his retirement in 1985, receiving an honorary DSc from Brussels.

His research on fluidisation flourished. The novel use of x-rays allowed him to study bubbling behaviour (winning IChemE's Moulton Medal in 1973), flow in the distributor region, mixing and segregation phenomena. He was much sought after as a consultant, in the UK and the US, by the users of big fluidised beds.

Peter served in and chaired many committees within UCL and IChemE, became a Fellow of the Royal Academy of Engineering, in 1981, edited Chemical Engineering Science from 1966-90, and acted as an advisor to government.

In spite of all this activity, Peter was in some ways most happy at his home in the beautiful village of Upper Basildon, where they lived for more than 60 years. There he pursued his hobbies of gardening and, especially after his retirement, making fine furniture.



Peter died on April 27, 2014. He is survived by Pauline and their two sons.

A second generation at Imperial

ISAAC WOLF JOFFE (Civil Eng 49-53)

Isaac was born in 1930, the son of A.S Joffe (who had himself attended Imperial College, from 1910 to 1914).

Isaac attended City and Guilds College, graduating in 1953, with a BSc in Civil Engineering, returning in 1956 to do a DIC. Not long after graduating, Isaac joined his father's Consulting practice, and his career was originally in designing reinforced concrete structures such as grain elevators, high rise buildings, freeway structures and various others.

He then moved into the start-up of a steel production facility as Technical Director and set up a mini Mill for steel rounds and sections. The company then added an electric arc melting furnace for scrap as well as a continuous casting plant for billets. The company went on to produce sponge iron from iron ore in a kiln. Isaac constantly improved the many technologies in all of these and the original capacities of the plants were more than doubled.

His technical responsibilities encompassed everything from concept through to construction, including the selection of equipment, installation and final commissioning. He was involved with two such projects and also all the large scale environmental facilities required to comply with all the latest laws.

Isaac had many outside charitable interests, involving medical clinics, schools and a large music school in a disadvantaged area. In all he had a very full and productive career and was always proud of his training at Imperial.

He leaves behind a son and two daughters.

Finding scientific explanations for ancient mysteries

GRAHAM MICHAEL HARRIS (Civil Eng 58-61, DIC 1963)

Graham had a very rewarding career in his chosen field of Geotechnical Engineering, specialising in practical soil mechanics applied to large projects, mostly in the mining industry.

He lived and worked in the UK, Canada and South Africa, before returning to Canada in 1987.

On retirement in 1994, he developed his writing skills, producing scientific articles and several books, most notably "Oak Island and its Lost Treasure", co-authored by Les MacPhie, and lighter fare including a book of short stories. Graham's earlier involvement in the construction of a potash plant in the Dead Sea had presented him with the opportunity for innovative research into the Biblical saga of the destruction of Sodom and Gomorrah.

Graham maintained that these Bronze age settlements had existed, and been built on the shores of the Dead Sea. His study led him to suggest that the settlements were wiped out when the land on which they stood underwent liquefaction during a severe earthquake ca. 1900 BC. He produced a paper which was used by the BBC as the basis for one of their documentaries in the Ancient Apocalypses series. Graham's 'final opus', as he described it, will be published in 2015, entitled "The Destruction of Sodom – a Scientific Commentary".

Graham died on July 9, 2014, aged 77. He is survived by his wife Susan.

Engineer, Barrister and passionate campaigner for the preservation of Regency architecture

MALCOLM WELSH (Mech Eng 58-61) BSc(Eng) ACGI LIB(Hons) CDipAF CEng MIMechE, Barrister



Malcolm James MacGregor Welsh was born in Rugby on April, 18, 1939, the eldest of three children, having two younger sisters, Sidney and Barbara.

Malcolm read engineering at Imperial 1958-61, and was awarded a first. He worked for steelmakers, Richard Thomas and Baldwin's, undertook research at Cranfield (where he learnt to fly), and then went on to work for Pilkingtons in St Helens, before taking up posts in Welwyn and then Leeds.

In 1975 Malcolm married Maureen Wells and had two children, Eleanor and James. Tragically Maureen died of a brain tumour in June 1979.

Malcolm's sister Sidney, her late husband Mike Tyrrell, and their two children Helen and Angela moved to Leeds in February 1980, and with Malcolm, Eleanor and James became a three parent family with four

children under four

As 'Uncle Malcolm', Malcolm became a second father to Helen and Angela, and subsequently the much loved Great Uncle Malcolm or 'Bum Bum' to Helen's children, Eve, Wilt and Seth. The Welsh-Tyrrell family moved to Leamington in July 1981, and Malcolm worked for 13 years as the MD of Abrasive Developments

In 1994, he set about achieving one of his life's ambitions: to become a barrister.

He became a member of Gray's Inn, and was called to the Bar in 1996 at the grand age of 57, working for the Judicial Studies Board in London until his retirement.

Malcolm's 'retirement' saw him take up scuba diving, travel to India, Egypt and Namibia (among many other places) as well as pursue his keen interest in local history.

Malcolm was passionate about the preservation of Royal Leamington Spa's Regency architecture and was an active member of the Leamington Society, and Vice Chair of the Central Leamington Residents' Association.

He played a leading role in the restoration of the Linden Arches in the Pump Room Gardens to mark the Queen's Jubilee, in 2012, an achievement of which he was particularly proud.

Malcolm died on December 17, 2012.

An avid historian

GEORGE ERIC JACKSON, (DIC Elec Eng 56-57)

George Eric Jackson was born in Newton-le-Willows, on January 28, 1934, to George and Agnes Jackson, and was the brother of the late Leonard Jackson.

At Newton Grammar School, he performed in Gilbert and Sullivan Operettas, also playing Laertes in Hamlet, and Macduff in Macbeth. An Electrical Engineering graduate of the Royal Technical College, Salford (now the University of Salford), he continued his education at City & Guilds College with a DIC in 1957. He was a life member of CGCA.

He married Eileen Hankinson in 1959, just before moving to Wakefield Massachusetts and then Concord Massachusetts, where they lived from 1966. He was employed in the electronics field by Transatron, Honeywell, Memory Technology, Nixdorf, Codon, Amnet and his own company Bridge International Consulting. He was also a member of the IEE and IEEE. He enjoyed

travelling to England and many other countries, including Sweden where, over the course of two decades, he played a very important role in the Swedish Defence Organisation. An avid historian, the two World Wars were his passion, as was the study of Winston Churchill's life. He was interested in model trains, aeroplanes, guns and target shooting, and was a life member of the Concord Rod and Gun club.

His family was his other passion. He loved to say that the best decision he ever made was marrying Eileen and moving to the U.S. He leaves three children and five grandchildren. An amazing story teller, he entertained his family and friends over the years with his amusing anecdotes, songs and wonderful sense of humour.

George died, unexpectedly, at the age of 78, on August 4, 2012, surrounded by his family.

'Kites rise highest against the wind, not with it' – Winston Churchill.

IMechE Medal winner

THOMAS GEORGE FELLOWS (Mech Eng 1944-47, DIC 1947-8)

Tom was born on June 12, 1928. After graduating from Imperial, in 1948, he joined D. Napier & Son as a graduate apprentice, subsequently becoming Development Engineer. In 1953 he joined NRDC (which would later become BTG), a public body set up to assist the transfer of the results of research into industry in the public interest. Tom was put on the Board of a number of subsidiary companies, including those developing computer aided design systems, marine hovercraft and an efficient continuously variable transmission (currently in existence as Torotrak). Between 1968 and

1974, Tom was appointed Managing Director of Tracked Hovercraft Limited, researching high speed intercity transport with the potential of replacing short haul flights and complementing the railways. Tom's efforts during this period were recognised with the award of the George Stephenson Medal of the Institution of Mechanical Engineers. He was appointed Deputy Chief Executive of BTG and retired in 1988, although he continued to provide his services as a consultant to Torotrak for a number of years.

Tom died peacefully in Oxford on May 11, 2012, aged 83. He was a dedicated family man and is much missed by family and friends.

OBITUARIES

A brave battle ended

KENNETH LAMB (Elec Eng 78-81)



Kenn served as Chief Executive of Cyan Holdings plc from 2007 until 2011. He was instrumental in transitioning the company from a narrowly-focused microchip controller manufacturer, to a system supplier offering an integrated suite of products for some of the fastest growing markets in the world.

At the helm during a testing period, given the onset of the global economic crisis, it is testament to his abilities that he successfully guided the Company, when so many other businesses did not survive.

Kenn's illness and subsequent retirement from the post of Chief Executive meant his involvement decreased significantly, but his experience and wisdom were keenly appreciated by the board and senior management.

Colleague John Read, said of him, "Kenn was an extremely impressive professional, a real gentleman and a good friend. We enjoyed working together and I shall miss him both professionally and personally."

Kenn passed away peacefully at home, on July 12, 2012, having bravely battled a long illness.

IEEE Power Engineer

Prof THOMAS JAMES HAMMONS, (Elec Eng 54-57, 57-61)



Born on June 18, 1933, Thomas graduated from City & Guilds College, in 1957, with First Class Honours in Electrical Engineering, BSC DIC and PhD. An IEEE Fellow from 1996, he was Chair of International Practices for Energy Development and Power Generation IEEE. He was a past Chair of the IEEE UKRI Section for which he received the IEEE Regional Activities Board Region 8 Sustained Membership Growth Award in both 2000 and 2001, and was also a past Chair of the IEEE UKRI Power Engineering Chapter for which he received the PES Outstanding Large

Memories of Bo – and other cars...

ANDREW P (PAUL) BENTLEY (Mech Eng 73-77)

Paul was born on April 11, 1954.

In his early career he worked at Lucas CAV in London, but by 1990 had moved to Schenck Process UK, where he was Commercial Manager.

Paul was a life member of CGCA. Fellow alumnus and friend, Mike Hill (Physics 1973-6), shared some memories of their time together at Imperial:

"Paul and I started at Imperial College in October 1973, and in our first and second years we both lived in hall in Bernard Sunley House (now called Bernard Sunley Hall), 40-44 Evelyn Gardens.

"We would regularly spend extended Sunday lunchtimes at "Strikes 1921" – an upmarket burger restaurant and Paul was notorious for smoking foul-smelling Sobranie black Russian cigarettes!

"In our third year (1975-76) Paul was elected 'Bo Driver' and so got to drive Bo on most of its outings. We did two Brighton Runs to my knowledge, November 1974 and November 1975, and the Manchester to Blackpool Run, in June 1976.

"During our third year, Paul and I shared a student union flat with six friends - and 6 cars between us: two minis, an MG Midget, a Triumph Spitfire, a Morris Minor, and a Hillman Hunter.

"Most of us graduated in 1976, however, due to his motor club commitments and social life, Paul didn't quite make it and took an extra year to graduate, achieving that in 1977."

Paul died on January 16, 2014.

A long and rich life

JOHN ULYSSES NEUKOM, (Mech Eng 49-52); Captain of C&G Hockey Club 50-52

John Neukom will be remembered by many as a kind, wise, generous and affectionate man. He had great self-confidence and a will to succeed. He lived a long and rich life, was married for sixty years to Barbara, raised three children and lived to see six grandchildren. He was a great lover of the English language, renowned for his diplomacy and eloquent turn of phrase.

John was born in Brixton Hill, London, on June 9, 1927, the only child of a British mother and a Swiss father. The war arrived when he was aged 12 and his parents were in Shanghai as one of a series of overseas placements. He was separated from them throughout the war and for a considerable period afterwards. He attended a Rudolf Steiner School in London which was evacuated during the blitz to Minehead in Somerset. The Steiner education he received was unusually enlightened for the time, being based on creativity and self-reliance. It worked well for him and this period shaped him and provided him with the qualities for which he was known and loved.

He attended Edinburgh University for just a year before being called up for National Service. He enjoyed his time in the army, rising to the rank of 2nd Lieutenant in the Royal Artillery and spending long periods in Germany immediately following the war, where his fluency in German was no doubt greatly valued.

John studied Mechanical Engineering at City & Guilds College, and took part enthusiastically in sporting activities, serving as Captain of the City & Guilds College Hockey Club in 1950-51 and '51-52. He met his future wife, Barbara, a staff nurse

at St George's Hospital, during this time.

He was a life member of CGCA.

After graduating, John started as a trainee Patent Agent in Liverpool and then in London. He joined the Atomic Energy Authority in 1960. The profession fitted him like a glove; the English language, law, discretion and science, all in one.

At AEA Risley he rose to become Director of Patents, which required him to be based at the London head office, from 1979, until his retirement in 1989. He was an active member of the Chartered Institute of Patent Attorneys. He also served as Chairman of his branch of the First Division Association, the Civil Service Union.

In retirement, John continued to pursue an interest in his profession, and was in demand for his expertise, particularly in the fields of European patent law and copyright. He was also able to play a greater role in the local and church communities, and indulge his hobbies of stamp collecting and gardening. John and Barbara also found time to travel, visiting USA, Australia and ultimately, China.

John always maintained family ties with Switzerland, retaining dual nationality throughout his adult life and never wasting an opportunity to exercise his skills in the German language.

John acted as secretary of his local Community Association, and was a long term member of the Village Produce Association, proudly entering his garden produce in Annual Shows. At Church, he served as a member of the PCC, as Treasurer and as Churchwarden. He and Barbara celebrated their Diamond Wedding anniversary in 2013.

John died February 23, 2014.

Consulting Engineer

GEOFFREY DERBYSHIRE (Mech Eng 55-58) C.Eng., M.I.Mech.E

Geoffrey was born on October 29, 1936, in Orrell, Lancashire.

He attended Upholland Grammar School, going on to study Mechanical Engineering from 1955-58 at Imperial College. After graduating, he was employed by ICI, Billingham as a Technical Officer. In 1960 he took up a post at Edinburgh University as Assistant Lecturer in the Mechanical Engineering Department and obtained his M.Sc. degree for his thesis:

'An Investigation of Surging in Helical Valve-springs'.

A move to Cardiff in 1962 followed and, during the next

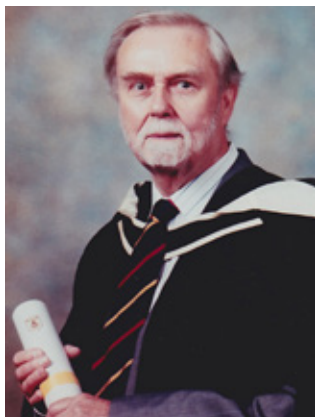
decade, Geoffrey held posts as Scientific Officer (DSIR), Development Engineer (Powell Duffryn Engineering) and Sales Manager (IBM). In 1974, he opened a practice as Geoffrey Derbyshire Consulting Engineer and, over the next 25 years, built a successful business, taking on several partners in new premises in Llantrisant, Mid-Galmorgan.

Geoffrey retired in 1999, to spend time playing golf, tending his beloved garden, travelling and writing.

He died on February 5, 2014 and is survived by his wife Krista, whom he met whilst on an ICI Student Exchange in Germany, their two daughters and four grandchildren.

A very special graduation ceremony - nearly 50 years after graduation

ROBERT GRAHAME SHARPE (Elec Eng 41-43)



Bob was born on October 9, 1923 in Croydon and attended Whitgift Middle School. In October 1941, Bob went to City & Guilds College, reading Electrical Engineering, where he graduated in the summer of 1943, before being commissioned in the RAF. He was posted to West Africa where one of his duties was providing ground/air radio communications (ex Spitfire radios) for landing fields being built in the region.

After his demob, Bob joined the Colonial Service and went to the Gold Coast (now Ghana) where he became Engineer in Chief at Post, Telegraph and Telephone service for the Gold Coast. In 1959, Bob returned to London and, for a short time, worked for Preece, Cardew &

Rider. In 1960 Bob joined EMI, as the Chief Engineer for a new radio/TV station in Kaduna, Northern Nigeria. At the time, the transmitters were some of the most powerful in sub Saharan Africa. Bob stayed in Nigeria until 1965 when he returned to the UK.

After leaving Africa Bob joined BOAC as Ground Communications Manager based at Heathrow Airport, his role and responsibilities carried him around the world. During Bob's time with BOAC, he was closely involved with one of the earliest global real time ticket reservations systems which was implemented by the company. Bob stayed with BOAC / British Airways until he retired in 1983.

He enjoyed travelling, both during his working life and into retirement and was a life member of the City & Guilds College Association.

In May 1992, Bob attended the special Graduation Ceremony for the University of London (Imperial College was part of the University during WW2) held at the Royal Festival Hall for those who graduated during the war, when there were no graduation ceremonies held.

Bob married Molly Dean in 1951 and they have 4 children, 7 grandchildren and 5 great grandchildren.

After a long and happy life, Bob died peacefully on May 3, 2014, at the age of 90.

Strong supporter of RSM and RSMA

IAN ROBERT MALCOLM CHASTON (Metallurgy 1955)

It is with sadness that we report the sudden passing of Ian Chaston, on May 29, 2014, at the age of 82. Ian attended the RSM from 1951 to 1955 and subsequently spent much of his career in South Africa where he gained a reputation as one of the world's experts in diamond processing. He was a stalwart of the RSMA in South Africa often welcoming and hosting new RSM graduates to the country and

industry. He was a regular attendee at the various mining functions in Kelvin House.

On retirement he indulged his passion for sailing and sailed a boat back to the UK from the USA. Even in his later years he was still sailing single handedly. He was a strong supporter of the RSM and RSMA in the UK and regularly attended all dinners and functions, as well as supporting the mining sundowners in the City.

Engineer and man of God

Rev PETER WILLIAM ROLAND WINDRIDGE (Mech Eng 46-49)

Peter was born on June 28, 1923. After a long career as an engineer, he was ordained at a relatively advanced age and served at All Saints and St John's, Shirley, later moving to South Croydon. Here he served in the team ministry based at St Peter's. Increasing support needs encouraged Peter to come to St Barnabas, Lingfield, a home for retired clergy with its chapel and continuing opportunities to share the Daily Office and celebrate Communion.

Peter's thoroughly-researched sermons were very much appreciated, as was his excellent singing voice - especially when proclaiming the Resurrection on Easter Eve.

He was a good friend, bringing the reflective wisdom of a long life well-lived, including his acquaintance with China and its lively Christian Church.

Peter died peacefully, shortly before his 90th birthday, on Saturday April 27, 2013, at the College of St Barnabas, where he had been living for the previous two years.

True professional, total gentleman, and mining legend

FRANK RUSSELL (MSc Mineral Production Management 74-75)

Frank Russell sadly passed away on September, 30 aged 68, after losing his battle with cancer.



Frank was born in Boldon Colliery in the North East where his father was the safety officer on the local coal mine. So a career in mining was not a surprise and he graduated from the Camborne School of Mines in 1967 but subsequently completed the MSc in Mineral Production Management at RSM in 1974-75. He was very able to diplomatically retain his loyalty to both institutions! After a brief spell in Ontario, he worked for 16 years at Mufulira on the Zambian Copperbelt. He returned to the UK in 1984 and, after two years with Seltrust, transferred to the Greens Creek mine in Alaska. In 1989, he joined Rio Tinto Technical Services following Rio's takeover of BP Minerals. Frank was recognised

as one of the world's experts in hard rock mining and especially latterly in Block Caving. He became Chief Adviser Underground Mining for Rio Tinto where he led, or made a major contribution to, the application of block caving mining methods at Palabora (South Africa), Argyle and North Parkes (Australia), Kennecott and Resolution (USA), Freeport (Indonesia) and Oyu Tolgoi (Mongolia). After retiring from Rio Tinto he was in much demand as a consultant and carried out studies of caving and underground operations in various parts of the world for numerous clients and often worked closely with equipment manufacturers on the development of appropriate technology. His expertise resulted in Sky News using him to comment on the Chilean mine accident where the miners were trapped underground for over two months, and also on the Gleison Colliery accident in Wales. He was the author of several papers on mining methods and mine design and wrote the article on block caving (Copper and the next generation of mines) that was published in IEI9.

A celebration of Frank's life was held on October 17, attended by family and dozens of colleagues from his Zambian, BP Minerals and Rio Tinto days. Words that were unanimously used by his ex-colleagues and friends were "true professional", "total gentleman" and "mining legend".

He will be sadly missed by all.

63 happy years

MAURICE JOHN BROCKMAN, (Elec Eng 47-51); CEng, MIEE, FRMetS

Maurice was born on January 14, 1923. He was an annual member of CGCA from before 1954.

His widow, Ms Sheila Brockman, said of him: "Maurice was always

very proud to have got his degree at Imperial, where he attended for the first year of our marriage in 1950. After he qualified in 1951, he went to the General Electric Company, retiring in 1984.

"I was so fortunate to have a very happy marriage for our 63 years."

NOTICES IN BRIEF

ARNOLD CAMERON-SMITH (Civil Eng 58-61)

Born on May 11, 1940, Arnold (Arnie), the much loved husband of Liz, died, unexpectedly, on December 24, 2012 at the age of 72, whilst on holiday in Abu Dhabi.

He will be greatly missed.

RICHARD STOODLEY (Chem Eng 58-61)

Born on September 12, 1937, Richard, the beloved husband of Barbara, loving father of Vicky and Cathy and devoted grandfather to Rob, Andy, Guy, Hugh and Emma, died peacefully, after a long illness, on August 31, 2014, aged 76 years. He will be sadly missed by all his family and friends.

STOP PRESS

REX EDWARD NELSON (Elec Eng 49-52)

Born on March 3, 1927, Rex Edward Nelson, the deeply loved and loving husband of Sheila, father of Sally and Michael, died on Tuesday November 13, 2012, aged 85.

The RSMA regrets to advise the death of Nigel Gravette, on 1st November. Nigel was President of RSM in 1963-1964. An obituary will appear in the next edition of IE.

