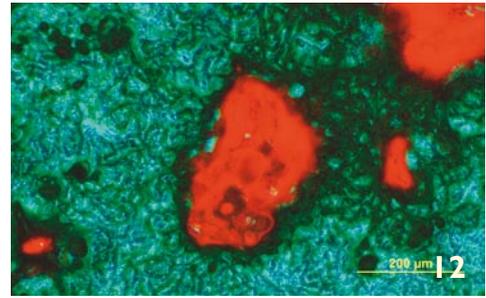


In this issue...



NEWS & REVIEWS

- 3 Presidents Report
- 4 New rector
- 4 Researchers recognised
- 5 RSM regains union status
- 5 RSMA Dinner reminder
- 6 21st century communication for RSMA
- 7 Meet new CGCA president
- 10 Diary Dates
- 22 Books
- 23–25 Alumni News & Reviews roundup
- 26–27 Obituaries

FACULTY NEWS

- 8–9 Faculty developments

STUDENT NEWS

- 4 Rugby tour
- 5 Green Team spans the Americas
- 6 Engineers win latest prize
- 10 RSMU roundabout
- 18, 19 Overseas projects

FEATURES

- 11 New vehicles for Africa
- 12, 13 Human bone growth closer
- 14, 15 Engineering education for the future
- 16 Social engineering in Newquay
- 17 Improving road pricing
- 18 Bridges help Bolivians
- 19 Rwandan power success
- 20 An idea whose time has come
- 21 Robby on jet development



COVER PICTURES. *Front: New bridge across a river in Bolivia. See page 18. Back: Jaguars on an internal mining road near Manaus, Brazil. Submitted by Ian Dun (who works there) and taken by visitor Leopold Bigarella. See page 25.*

Imperial ENGINEER

EDITORIAL BOARD

Bill McAuley (Managing Editor)
Bill Bradford
Peter Darling
Paul Holmes
Chris Lumb
Colleen Shilstone Richardson
Teresa Sergot

PRODUCTION EDITOR

Lynn Penfold

PRINTING

Bishops Printers, Portsmouth

CORRESPONDENCE and ENQUIRIES

Teresa Sergot
Engineering Chapter
Level 2, Faculty Building
Imperial College, London SW7 2AZ
Tel: +44 (0) 20 7594 1184
Email: t.sergot@imperial.ac.uk
Chapter website:
www.imperial.ac.uk/engineering/aboutalumni
CGCA website: www.cgca.org.uk
RSMA website: www.rsm-association.org

STORY IDEAS FOR THE NEXT ISSUE BY NOVEMBER 26 (see page 25 for explanation)
FINAL COPY DEADLINE MARCH 18 2011

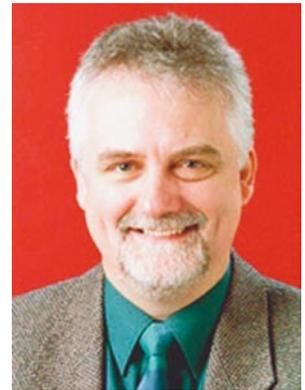
The editorial board of *Imperial Engineer* reserves the right to edit copy for style and length.
Imperial Engineer is printed on Forest Stewardship Council registered paper

This is my first opportunity to address many of you since my election as President. Like a recent predecessor, Dame Julia Higgins, I did not study in City and Guilds College but arrived at the College as a 'fully grown' academic! That was some 26 years ago. I am deeply honoured that you have elected me as president and I am looking forward to serving you.

Although it now seems a distant memory, at the AGM in May, Professor Steve Furber entertained us with a talk on 'The Relentless March of the Microchip' which reviewed the development of integrated circuits and made some conjectures about future developments. Steve is a professor in Manchester but was also the principal designer of the ARM 32-bit RISC micro-processor used in most mobile phones. I am pleased to announce that shortly after our AGM, he became a laureate of the 2010 Millennium Technology Prize which is the world's biggest technology prize, awarded by Technology Academy Finland, and which rewards life-enhancing technological innovations.

Since the AGM, we have held two general committee meetings. The main objective of these was to continue the work of my predecessor, John Loughhead, to improve recruitment and the service offered by CGCA to you, the membership. We are developing a number of ideas, including the use of social networking and new schemes for recruiting students and fresh graduates, which I will report on more fully in future issues. We still need to fill a number of vacancies on the General Committee and I would be delighted to hear from you if you would like to get more actively involved in the running of the Association.

Two dates for your diaries are the Christmas Lunch (December 16) and the Annual Dinner (March 9 2011). Baroness Sue Garden, a long-time friend of the Association, will be our principal guest at the Christmas Lunch. She will talk about cyber security in the context of her past work in the House of Lords' European Committee. Our principal guest for the Annual Dinner will be the new rector of Imperial, Sir Keith O'Nions. Please look out for further details of these events and I hope to meet some of you personally at one or other of them.



**Chris
Hankin**

PRESIDENTS REPORT



**Coen
Louwarts**

THE NEW academic year for RSM has started with a bang, with the first year being oversubscribed. Over 180 students will be starting their university life at the Royal School of Mines, finding their way around campus to lectures, joining sporting clubs, making new life-long friends, learning relevant professional skills and embracing the RSM spirit (and hopefully learning a few RSM songs along the way!).

It's the duty of the RSMA to help foster this unique spirit and support students along their way. It would be great to see alumni offering help, perhaps via donations to the RSMA, but definitely via mentoring, either from an academic perspective or on future career guidance. Especially with the resource industry coming out of recession, it's very likely that we will start experiencing a skills shortage again. Over the years, RSM alumni have proven to be very successful and are employed in a wide range of industries. If you have any work experience positions available or are looking for new employees, can I urge you to think of the current students and recent graduates.

This year the RSMA will organise a number of informal student/alumni gatherings here in London. However, through our renewed web presence (more on this on page 6), it's also easy get in contact with us and students from anywhere in the world. We will keep you posted either via email or LinkedIn.

It was great to see a good turnout at the Final Year Barbecue in June with even an alumnus from Australia visiting. I hope to see many of you back at this year's 126th Annual Dinner which takes place on Friday November 19 in South Kensington. If you haven't already done so, please fill in the form which is enclosed in this magazine.

Finally, I would like to take this opportunity to thank Rosie Tipples from the Chapter Office, who has moved to a new role within Imperial College. Over the last few years she has helped out the RSMA tremendously, and I wish her all the best in her new career.

New rector



SIR KEITH NIONS (above), who has been acting rector of Imperial College since January, has taken over as rector until the end of 2013. He joined the College in 2008 as director of Imperial's Institute for Security Science and Technology.

Prior to joining Imperial, Sir Keith held a number of senior government advisory posts, while for 30 years he has taught, researched and led departments in some of the world's other top universities, including Oxford.

Sir Keith said: 'There are tough challenges ahead but Imperial isn't going to stand still. We'll continue to advance our academic mission by strengthening our core disciplines, providing time and space for interdisciplinary work, investing in the student experience and maintaining the high quality of our support staff.'



Royal audience

JEAN VENABLES, pictured after receiving her CBE from Princess Anne. This follows her MBE for services to civil engineering and her OBE for services to flood defence. Jean (Civils 69), who was the first female president of the Institute of Civil Engineers, is one of the UK's leading experts on strategic flood risk management. She is chairman of Crane Environmental, the company she runs with her husband Roger.



AMONG the 53 new fellows announced by the Royal Academy of Engineering are five from Imperial. Pictured above, from left, are Prof Jan Cilliers (Earth Science and Engineering), Prof Stephen Muggleton (Computing), Prof Constantinos Pantelides (CTEC), Prof Alexander Taylor (Mech Eng) and Prof Guang-Zhong Yang (Institute of Biomedical Engineering and Dept of Computing).

These five are developing medical robots, improving combustion engines, refining mining technologies and creating computer models to advance manufacturing and agriculture.

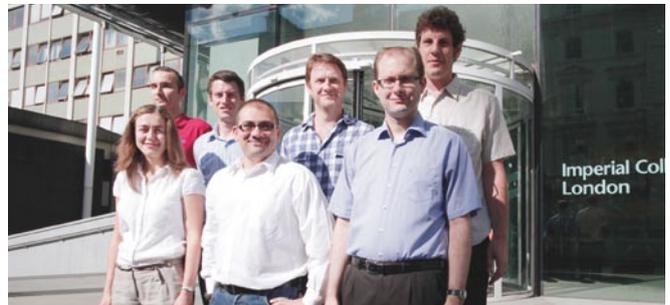
Engineering Faculty principal Prof Stephen Richardson said: 'This year's cohort demonstrates the essential role that engineering plays in tackling some of the world's biggest problems.'

Pictures: Imperial College, Dave Gutteridge, The Photographic Unit

Jolly good fellows all

RESEARCHERS focusing on state-of-the-art eco engines, gloopy cells and nanoscale light are amongst the nine scientists from Imperial awarded Engineering and Physical Sciences Research Council (EPSRC) fellowships this month.

The researchers have been awarded more than £8 million in two different kinds of fellowships – Career Acceleration Fellowships and Leadership Fellowships. The former gives support to early-stage researchers and the latter support talented researchers with the most potential to develop into international research leaders.



Outside Imperial: Seven of the nine researchers who are Robert Beardmore, Catrin Davies, Kenneth Harris, Marina Kuimova, Alessio Lomuscio, Sergio Maffei, Greg Offer, Rupert Oulton and Marina Kuimova.

Picture: Imperial College, Layton Thompson.

Hospitality wins

THIS SUMMER 41 members of ICURFC completed a gruelling 18-day rugby tour to Japan, visiting the ancient capitals of Nara and Kyoto, as well as the more modern cities of Tokyo and Osaka.

The tour was a challenge, but it was an experience the players will never forget thanks to support from Sport Imperial and the Old Centralians' Trust.

'Our first set of games was against Kyoto University,' reports tour manager Jovan Nedic.

Playing to a crowd much larger than expected, Imperial 1st XV, known on this tour as the Imperial Ninjas, put in a great performance, despite heat and humidity, and won 61-19. The Imperial 2nd XV, aka the Imperial Barbarians, gave a brave performance but Kyoto's 2nd XV came away victorious – 34-19.

The lavishness of Japanese hospitality certainly took the visitors by surprise throughout the tour and even Jovan's speech in Japanese went down well after the first match. A particularly valued souvenir is a Samurai helmet given in Tokyo.

Also in Tokyo the visitors played ex-pat Yokohama Country and Athletic Club and Tokyo University. The latter had brought in some alumni from the last decade to bolster their side. The home teams won as they did in the last stop, Osaka.

There was plenty of time for site-seeing and one of the touring party even reached the summit of Mount Fuji and back to the bus station in five hours, a remarkable achievement!

Full match reports are on felixonline.co.uk and icurf.co.uk

Students get good send-off

THE RSMA'S AGM was well attended, even having overseas members participate in the debate. The committee welcomed two new members, David Bishop and Matt Cockayne.

After the AGM, the now-traditional barbecue was enjoyed by around 50 students and alumni. There was great food and excellent ale donated by Eddie Gadd from Ramsgate Brewery.

The RSMA organises this end of academic year get-together to send graduating students off into the wide world of work. Many took the opportunity to question alumni about careers and jobs, and of course the members shared some invaluable advice and insights. Needless to say some of the discussions continued into the small hours.

RSM regains union status

A VOTE at the final meeting of Imperial College Union Council has reinstated the Royal School of Mines executive from a clubs and societies committee (CSC) to a constituent union of Imperial College Union.

The reclassification of the RSMU as a CSC occurred around nine years ago when College re-structured departments, combining the City and Guilds College and the RSM into the Faculty of Engineering. The Union followed College in restructuring, with the Royal School of Mines Union (RSMU) being swallowed by the City and Guilds College Union (CGCU).

It was assumed that over time the RSMU would die out, with the name maintained for the sake of historic clubs only.

However, the RSMU has failed to disappear, instead proving time and time again to be one of, if not the, most active and dynamic student bodies within Imperial College Union. It is an entity which simply does not fit the description of a clubs and societies committee on many significant levels.

The move allows for the students of the RSM to separate themselves from under the umbrella of CGCU, their supposed

rivals, and for the development once again of an independent mentality.

It should also prove to be a step which will re-ignite and enhance this once celebrated rivalry, whilst serving to safeguard many other aspects of the RSM's rich history.

With RSM having many traditions that are older than Imperial College itself, this is a vital step towards preserving the Royal School of Mines identity within the student body.

Danny Hill, deputy president (Finance & Services, RSMU)

In Brief

Dinner reminder

RSMU'S 126th Annual Dinner is taking place on November 19 at the Polish Club. You may still be in time to book a place if you go to the booking form including with this magazine. Or contact Teresa Sergot as on page two.

Latest list for London treks

WALKS round London are continuing to follow a schedule outlined by guide Malcolm Dick. See future walks listed under Diary Dates on page 10.

Green machine takes on America

IMPERIAL RACING GREEN, which draws expertise from across the Faculty of Engineering involving nearly 100 students, has had some notable achievements this year.

Designs for two Formula 1-style vehicles won places in the international competition, the Institution of Mechanical Engineering's 13th Annual Formula Student competition. Their all-electric single seat Imperial Racing vehicle won third place, while the IC06 combustion engine vehicle came fourth. They

are now working on the vehicles ready for 2011.

In a separate project the five-man team of Racing Green Endurance (RGE) is soon to finish its record-breaking 26,000km journey from Alaska to Chile on the Pan American Highway.

Before leaving in July, one of the world's fastest sportscars, the Radical SR8, was converted to electric and renamed the SRZERO. It broke a UK record by circling around the M25 twice on one battery charge, much

to the joy of undergraduates, postgraduates and alumni working on it.

From Quito, Ecuador, the journey's PR director Andy Hadland writes: 'The people and the scenery are both equally incredible! The reception our project has received has been overwhelming, especially in Central and South America.'

'So many people are willing to take time out from their busy lives and help us organise media events, charging points, introductions to energy ministers and many other things. We have been in the national media in every country we have been through, so now hopefully millions of people will hold the perception that electric cars (EVs) are not just cleaner, but fast, sexy and fun to drive!

'We've seen many examples of people asking our advice on EVs as they try to set up their own EV projects in



ABOVE: Pictured in San Francisco by Howard Wise. **LEFT:** The team of Alex Schey, Andy Hadland, Toby Schulz, Nik Sauer and Clemens Lorf in Quito with one of their 'rescuers'.

their countries. EAFIT university in Medellin, Colombia is a good example.'

A somewhat embarrassing demonstration of how fast EVs can be was 'an all-too-quick introduction to a wall in Quito in front of 300 students and national media. Locals weighed in to help and they were back on the road in no time and expect to reach the end in November.'

To follow their route see <http://racinggreenendurance.com/>



Composting shows way

A NEWLY-DESIGNED composting unit is saving a tonne of food waste from landfill every week at Imperial, including 100% of the hot food waste from the College's three main restaurants

The composter, created using research from the Civil & Environmental Engineering department, will turn the

waste from the Campus's food outlets into compost which is being used to enhance campus green spaces.

Waste and recycling manager Nic Dent says: 'Having this recycling process take place on the campus visibly demonstrates what can be achieved with green initiatives. I hope its

success will encourage all of us to think about how we dispose of other items of waste and inspire us to do the right thing – reduce waste by recycling as much as possible.'

Watch the journey from café to compost: <http://www2.imperial.ac.uk/imedia/videos/view/713/CompPod>

Molly is tops

PROFESSOR Molly Stevens from Materials has been listed as one of the top 10 scientists in Britain under the age of 40. Eight other Imperial researchers are in a list of the top 100 scientists published by the monthly science magazine, Eureka Professor Guang-Zhong Yang – see opposite – was listed 81st.

NEWS & REVIEWS

ONE OF the things I've tried to do this year in my role of junior vice president for the RSMA, responsible for increasing communication, has been to meet as many alumni as possible when away on business trips. The one clear message is the RSMA needs better communication between alumni, the committee and London.

Apart from some friendly faces to have a beer with, it also allowed me to explore a little of what is going on with RSM alumni worldwide. Perhaps most importantly the visits have provided some insights into how the RSMA can improve what it delivers for members.

This had already started when I first got involved. Harald Bornebroek (MinEng 96) had already set up the LinkedIn group and several Facebook groups were already in existence. All the RSMA had to do was join in!

Quickly members began to want a higher purpose than just collecting other people's contact details. As such the RSMA is now hoping to use a variety of social media to advance alumni careers through mentoring, international networking and other career development services.

This includes communication up and down the different generations of alumni; communications across the different locations in the world where alumni tend to cluster; communication between members in local areas; and communication with 'headquarters' in London and College itself.

London calling

To solve this issue, the RSMA has decided to get with the times and use the latest social media tools to try and bring our alumni closer together. As well as a new website (www.rsm-association.org), we now have a LinkedIn group (search for RSM Alumni) and will shortly be launching a new Facebook site and, if all goes well, maybe even a Twitter feed. Imperial Engineer will still of course

JOHN SYKES gained a masters in geology in 2006 and has a masters in geophysical hazards. A very sociable union member from the start, he was president in 2004-5. He's a partner in his own consultancy, Greenfields Research, which specialises in the analysis of mine project development markets. www.greenfieldsresearch.com

Contacts, dear boy!

RSMA communicates the 21st century way, by John Sykes



arrive for members twice a year and don't forget the students have their own website as well (www2.union.ic.ac.uk/rsm).

Across the world

There are already over 300 alumni across the world getting to know each other. I've made new RSM friends in the USA, Australia, Namibia, South Africa, Norway, the DR Congo, Malaysia, Saudi Arabia, France, Belgium, Canada, Serbia, UAE, Germany, Gabon and Switzerland, which is certainly fulfilling the criteria of communicating with alumni worldwide! I encourage you all to do the same by joining the LinkedIn group.

To support this we will soon be launching 'location' sub-groups on LinkedIn - probably the UK, Europe, Africa, Asia, Australia, Canada, the USA, and South America to start with. The focus of these groups will be to bring members together who live in the same locations, yet didn't realise there were so many other alumni nearby. Hopefully these groups may act as a spur for other alumni hotspots around the world to follow the example of Perth, Australia and organise a regular monthly meeting, and even an annual dinner with Cambridge School of Mines alumni!

The groups should also be an asset for the business travellers among us. Every time you arrange a trip, you will be able to see if there are any RSM alumni among your destinations who'd be happy to meet and exchange old Bottle Match stories - they may even have local business contacts for you!

For those who don't want to use social media, we'll be using more traditional communication techniques. For example, it was suggested by mem-

JOHN, second left, at a beer and curry night in Perth, Australia, with June Burke, Roger Pooley, Josh Wright, Andrew Smith, David Chlup, Alan Dickson and Patrick Burke. Alan (alan@dickson.com.au) organises 'meet ups' on the first Friday of the month in the Celtic Club. John also met groups and individuals in Vancouver and Kuala Lumpur. In the latter, Ili Afifuddin (Geology 05) a Petronas employee, took him up to the Level 42 bridge between Kuala Lumpur's famous Petronas Twin Towers!

bers in Vancouver that the RSMA should facilitate an email address exchange amongst members, so they can get in touch and arrange their own events and meet-ups. We will be trialling this in Vancouver, Perth and London, with a view to somehow expanding it globally, while ensuring we stay within data protection laws

Across the generations

The very nature of social media though is 'bottom up' with ideas and changes coming from the users rather than organisers. Indeed, people have already begun suggesting their own ideas and demanding a greater purpose to the groups. We have already set up six industry specific subgroups on LinkedIn: accounting and finance; academia and research, management, materials industries, mining industry and oil and gas. Some members have already stepped forward to manage these sub-groups and numbers are building.

Ultimately though members would like to use the groups for career personal development, as well as networking - an issue that dovetails with something the RSMA has
(Continued on page 10)

A MAN FOR TWO 'SEASONS'?

PROFESSOR Chris Hankin is the president of the City & Guilds College Association for this current year and, if many of the committee and members have their way, he will remain president for a further year. Current thinking is that presidents require two years to make an impact with their fresh ideas and energy to build up the rather flagging CGCA.

In the spring of 2009, president Julia Higgins and past president Peter Garratt were pushing the idea of linking current students with alumni by using departmental societies as the bridge. Last president, John Loughhead, had a series of brainstorming meetings where the debate was how best to maintain the core traditions of the CGCA and to operate effectively in the modern world.

Chris Hankin has picked up the baton and is determined to increase the membership and reactivate the Association into the vibrant, positive thinking organisation it was in the last century.

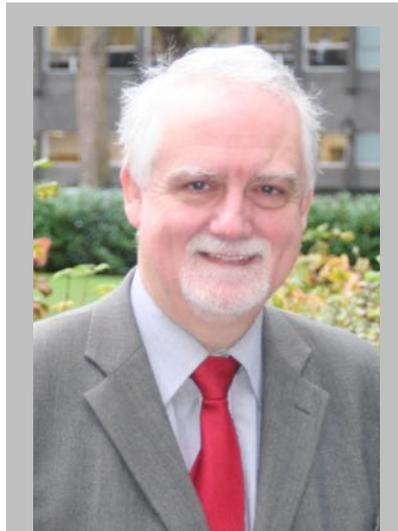
'I have great faith in the CGCA,' Chris told me. 'I think it provides really worthwhile support and does a lot of good for current students. It also provides a nice networking atmosphere for the alumni. But the College has changed so dramatically recently that I think we have to take a step forward in order to help and encourage the students in a new way and show the alumni some fresh advantages they would achieve by becoming members. I think it's so sad that the recruitment of young members has dropped off so much in the last four or five years. Sadly, the CGCA has also had several older but active and influential people dying lately.'

Early attraction

'It appears to be suffering from a low profile recently so we need to get fresh graduates to sign up and join. My graduate son, David, was a Bo driver and he often is surrounded by a group of students when he is inspecting Bo. He sometimes tells them about the CGCA and hopes the glamour of seeing Bo will encourage them to join.'

'When I came here in 1984, I only became aware of the history of the City & Guilds College the following year. This was because 1985 was its centenary year, and I got swept up in helping with

all the celebrations. It was not, however, until I became dean of the City & Guilds College in 2000 that I became aware of the CGCA. The admission and senior tutors were all aware of the CGCA, however, because of the drinks reception held by the OCFTrust, but the majority of the academics in the departments were completely unaware that it existed.'



*Colleen Richardson
interviews the man
whose term off office
as president of the
CGCA started last May*

'Unless we broaden the awareness of these academics to its existence, then it's unlikely that we will get many recruits.'

'Also the feeling of "oneness" has changed as sometimes as many as 50% of graduate engineers end up going into finance or into some management consultancy. When surveyed initially, 50% of students who came here to read engineering were intending to go into some kind of engineering career. When they were surveyed after their graduation, the number had fallen to 25%. Maybe CGCA should broaden its appeal. Our Association must move with the times.'

'There is also the fact that many of the members are centred round London. What is happening to the others?'

I asked Chris about his appointment last December as director of the

Institute for Security Science and Technology. At Imperial, he is a professor of Computing Science and is a head of the Theory Section in the Department of Computing. His research is in semantics-based program analysis and language-based computer security.

Before this appointment Chris Hankin was deputy principal of the Faculty of Engineering until October 2008.

'I have a base in computing and so report to the principal of the Faculty of Engineering but my Institute sits in the Faculty of Natural Sciences so I report there as well. The Institute is mainly for the College but we do have some partnerships outside. We are very technical in this area of security and when we talk about the applications of our research we talk to people like the Ministry of Defence on a regular basis.'

Research

'My particular research is in terms of understanding what programs are trying to do. This means understanding what they are meant to do and whether they are trying to do "bad things". This is all to do with software theft and protecting your programs against software theft.'

'We are interested, for instance, in the London Olympics. There are huge security implications in controlling people's access to events and to the Olympic Village as there will be such a large number of people in one place.'

'These are security issues that the Institute was set up to look at. It tries to sort out the problems that kind of event brings. We are trying to bring together teams that have the skills to address this problem. Civil and chemical engineers meet the issue of security on a regular basis.'

'One specific thing I am doing, which is more computer-related and where I am the principal investigator, is to provide support to people who are trying to investigate organised crime. These investigators have huge amounts of data to work with. They visualise it on the computer screen and can quickly realise what's going on. The data is arranged in such a way that it can be used as part of the decision-making process of an investigation.'

'My project is called "Making Sense" and it's a great challenge.'

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

New lab structured for greater capability

IN TIME for the autumn, new world-class facilities have been unveiled at the launch of the Structures Laboratories in the Department of Civil and Environmental Engineering. A £2 million investment in new equipment is allowing researchers to explore issues such as

how structures and materials respond to different loads and conditions, from withstanding earthquakes and fire, to the mechanisms behind the deterioration of concrete. Professor David Nethercot (Civil and Environmental Engineering) said: 'One of the strengths of

structural engineering here at Imperial is the value we've always placed on laboratory testing facilities, as a crucial part of the research programme. These upgrades to our facilities will provide better functionality, greater research capabilities and better data capture.'

Public help can save more power

SWITCHING off lights, turning the television off at the mains and using cooler washing cycles could have a much bigger impact on reducing carbon dioxide emissions from power stations than previously thought.

Research reveals that the figure used by UK government advisers to estimate carbon dioxide saved by reducing people's electricity consumption is up to 60% too low.

One way governments are trying to mitigate the effects of climate change is to encourage people to reduce their energy consumption and change the types of technologies they use in their homes.

'The UK government currently bases its policy decisions on an estimate that, according to my research, is lower than it should be,' says Dr Adam Hawkes of Imperial's Grantham Institute for Climate Change.

Chemical couture on catwalk

A FASHION show featuring spray on clothes – Science in Style – rocked Imperial in September. Prof Paul Luckham (Chemical Engineering and Chemical Technology) and academic visitor and designer Dr Manel Torres are the creators of this material called Fabrican Spray-on fabric. It can be sprayed directly onto the body using aerosol technology and can be sprayed on other surfaces for medical bandages and even upholstery. 'As a fashion designer it feels great to be able to spray on material and be able to create whatever you like,' says Dr Torres.

Google 'Science in Style' fashion show for photos and videos of spray-on clothes.



Are we blowing money away?

A NEW report, headed by Dr Robert Gross (Centre for Environmental Policy) has warned that wind farms cost twice as much to produce electricity as gas- and coal-powered stations and will need subsidies for at least 20 years.

The report from the UK Energy Research Centre, stressed that there are also grounds for optimism and that costs could be reduced if the government

increased production capacity in Britain, as announced recently,

Dr Gross said: 'Despite everything we still think wind farms are worthwhile energy producers. All alternatives, such as nuclear and carbon capture are bound to have teething problems too.' He added: 'This report suggests that policies could do more to bear down on costs and support a UK-based industry.'

Exhaust waste could be saved

WORK, led by Ricardo Martinez-Botas (Mechanical Engineering), could significantly increase the efficiency of the internal combustion engine by making better use of wasted exhaust gas energy

He explains: 'A normal turbocharger takes some of this energy that would otherwise be wasted to the atmosphere, but not all of it. The turbocharger is designed for a steady-state

operation, whereas the exhaust gases increase and decrease at the rate of the engine reciprocation. The idea is to oscillate the turbocharger's variable geometry and synchronise it with the engine exhaust to get better energy recovery from the pulsating exhaust flow.'

See the article at <http://www.theengineer.co.uk/news/news-analysis/increasing-engine-efficiency/1002093.article>

Another way oil is polluting the oceans?

OIL SPILLS can increase levels of arsenic in the ocean, creating an additional long-term threat to the marine ecosystem, according to research by a team from Earth Science and Engineering.

Sea water containing high levels of arsenic (which is also present in oil) can allow the toxin to enter the food chain. It can disrupt the photosynthesis process in marine plants and increase the chances of genetic alterations that can cause birth defects and behavioural changes

in aquatic life. It can also kill animals such as birds that feed on sea creatures affected by arsenic.

The team has discovered that the oil spills occurring every day around the world can partially block the ocean's natural filtration system of sediments and prevent them from cleaning arsenic out of the seawater. The researchers say their study sheds light on a new toxic threat from the Gulf of Mexico oil leak.

How did 3D blob evolve?

A BLOB-LIKE creature, a drakozoon, that lived in the ocean approximately 425 million years ago, has been revealed in a 3D computer model at Imperial. It is helping scientists understand what primitive creatures on early Earth looked like and how they might have evolved

into the types of creatures that are on Earth today. 'We think this tiny blob of jelly survived by clinging onto rocks and hard-shelled creatures, making a living by plucking microscopic morsels out of seawater,' says Dr Mark Sutton (Earth Science and Engineering).

DEVELOPMENTS AROUND THE ENGINEERING FACULTY

Trailblazing for students

IN A PIECE of education trailblazing, the Faculty of Engineering has appointed the UK's first tutor for student-led projects.

Recognising that Imperial's engineering students run serious projects in their 'spare' time, the Faculty asked Civil Engineering's lecturer on construction law and management, Alison Ahearn, to take on the tutor role. She is helping the transfer of know-how among project leaders; unravel red tape on such matters as insurance and risk assessment; bolster the skills learning, and use the projects to inspire other students.

Alison had already mentored projects such as the El

Salvador Project (earthquake relief, flood prevention by civils students). She now helps the established projects, such as e.quinox (electrification for Rwandan villages by EEE students) with knowledge transfer and acts as 'devil's advocate' on new projects (such as a student's plan for telemedicine in outback Pakistan).

'My job is to help students see beyond the technical challenges to the issues of management, risk, skills, funding and continuity,' says Alison.

A recent review by Loughborough University looked at employability skills via extra-curricular activities. Of the few



universities that have student-led projects, they saw Imperial as the national leader and the only institution to support it with a formal appointment of a tutor, making Imperial the innovator for extra-curricular engineering education. a.ahearn@imperial.ac.uk

Entrepreneurship could win awards

IMPERIAL has been shortlisted for two categories in the *Times Higher Education Awards 2010*. The winners in 18 categories will be announced at a ceremony at Grosvenor House Hotel, London on November 25.

Chosen from almost 500 entries, Imperial could win the 'Outstanding Support for Early Career Researchers' and the 'Entrepreneurial University of the Year' categories. <http://bit.ly/cOzx28>

Imperial in top 10

IN THE TIMES Times Higher Education World Rankings, Imperial is one of only three UK universities in the top 10. Imperial is ninth, with Oxford and Cambridge in joint sixth position. <http://bit.ly/crtd79>

Fraternal help in Texas

AMONG the thousands of airline passengers stranded by ash clouds from the Eyjafjallajökull volcano were more than 50 Imperial students and professors on a field trip in Texas.

They were soon made welcome by the University of Texas (UTEP) and bunked there until they could return home. One UK academic even gave a special seminar for UTEP's geology graduate students on ancient seas. 'We're very grateful to UTEP,' said Cedric John (Earth Science and Engineering). 'Everyone has been so nice to us.'

ESE plans to sponsor a return trip by UTEP students and staff to Imperial.

Lucky few join Antarctic expedition

IMPERIAL engineers are among a team of explorers and scientists making the final preparations for a record-breaking 3,600 mile scientific expedition across Antarctica.

Making the journey will be the Moon Regan Transant-

arctic Expedition's six-wheel-drive mobile laboratories and the biofuelled Winston Wong Bio-Inspired Ice Vehicle (below), which have been on display at Imperial.

The crew will rely on the latest in mobile sensors, de-

veloped at Imperial and fixed especially on the Ice Vehicle. They will monitor and measure every aspect of the journey and collect data that will support research into meteorites, solar radiation and wind turbulence. The Ice Vehicle will lead the expedition and will analyse aspects of the snow surface and enable scientists to examine pollutants carried there from across the world.

The expedition offers a lucky few a rare opportunity to measure, monitor and learn in one of the world's last great wildernesses and to collect research data for themselves and for colleagues back home.



Study sees between cracks of Earth's crust

RESEARCH reveals that when two parts of the Earth's crust break apart, this does not always cause massive volcanic eruptions. The study, led by Earth Science and Engineering's

Dr John Armitage, explains why only some parts of the world saw massive volcanic eruptions millions of years ago.

'Our study is helping us to see that the history of a rift is

really important for determining levels of volcanic activity when plates break apart. We now know this is just as important as mantle temperature in controlling volcanic activity.'

Researchers race for space rocks

METEORITE researchers are racing private buyers to purchase rare space rocks, even helping dealers to identify fragments in exchange for samples.

'I'm aware that researchers perform analyses for dealers. I don't like it, but I understand the logic,' said Professor Philip Bland (Earth Science and Engi-

neering). 'If they don't do it, the meteorites will remain solely in private hands, sitting in a collection, and will never be seen again.'

The source of most of these articles is the College's press releases. For more on these stories, go to Imperial's press releases at www3.imperial.ac.uk/news

DIARY

Friday November 19
126th RSMA Annual Dinner
Ballroom, Polish Club
Ognisko, 55 Exhibition
Road, 19:00 for 19:30
Booking form on back
of address carrier

Saturday November 27
CGCA Decade Reunion
Luncheon, Polish Club
Ognisko, 55 Exhibition
Road, 12:00 for 12:30
Booking form on back
of address carrier

Thursday December 16
CGCA Christmas Lunch
170 Queen's Gate, 12 for
12:30
Booking form on back of
address carrier

Tuesday March 9 2011
CGCA Annual Dinner
Saddlers' Hall, 18:45 to
22:45
Booking form inside IE

CGCA London Walks
Saturday January 29
Wordsmiths:
Monument to the Globe
via Chaucer, Dickens and
Shakespeare

Saturday April 9
Islington
Angel through the Victorian
squares and back to Angel

Saturday June 25
Without the City Walls
Tower Hill along the
eastern boundary to
Spitalfields via Aldgate and
Brick Lane

All welcome. Please email:
johnsheilabackhurst@tiscali.
co.uk for further details

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

RSMU gives good send off

AT THE end of an academic year many students feel weary and drained, both mentally and physically, a situation which distresses us at the RSM. As a remedy, each and every June the RSMU puts on a final showpiece event to remind undergraduates, post-graduates, staff and alumni alike of the fantastic year gone by – the RSM Final Finale.

Not just a pick-me-up before the summer break, the Final Finale provides an opportunity for students to be recognised for their contributions to the RSM through colours and awards ceremonies; is a stage for the official handover of the RSMU committee to next year's committee-elect, and, possibly most importantly, an opportunity for the RSM to provide a final send-off to students who are graduating.

Special thanks go to SGA Resources Inc, David Laing and Caterpillar's global mining division for their munificent sponsorship of the 2010 RSM Final Finale – fantastic decorations and awards and copious volumes of drink and buffet food ensured that the 2010 Final Finale went with a bang.

An extra large thank you also goes to RSMA past president Giles Baynham, who voluntarily helped coordinate the sponsorship drive for the 2010 event. Without his efforts it would have been extremely difficult to put

on the event at all.

During the mainly relaxed evening, 14 students were awarded RSM half colours, while nine received full RSM colours.

Awards

Distinguished awards went to **Samantha Jones, Katie Vowles, Alistair Philpott** and **Louisa Stokes** (RSM Union General Award for 'substantial contributions to the RSM during the length of their degree')

Matthew Wilks (AC MacCarthy Pot for 'outstanding overall sportsman of the year')

Jamie Thomas (Mick Moore Pot for 'outstanding effort by a fresher for the RSM')

Henry Debens (RN Pryor Pot for 'outstanding service to the RSM')

John Cosgrove (the Peter Harding Memorial Pot for 'outstanding long-term service to the RSM').

The (in)formalities were rounded off by a spate of light-hearted spoof awards before the handover of the infamous presidential pink pants. Benjamin Moorhouse, the RSM president-elect, donned the pants and gulped down his yard with next to no loss of dignity, suggesting the RSM is in for a year of outstanding leadership from a dedicated RSM patriot.

All that was left to do was for the RSM to celebrate the success that has been the 2009/2010 academic year, in the outrageously, jovial fashion for which it has always been known. **Henry Debens, outgoing RSMU president**

Contacts
dear boy!

(Continued from page 6)

been trying to implement for a while, and one of the causes Coen Louwarts mentioned in his editorial in this issue – mentoring.

We would like to start using these industry sub-groups to match students on courses in the RSM – geology/geophysics, materials engineering, petroleum geology/science/engineering, mining and energy finance with practitioners in the

corresponding industries.

The benefits would be for both students and alumni. Students would have the opportunity to discuss coursework and dissertation trends with people in the industry; seek help and advice from fellow students or alumni, and begin to make contacts with potential future employers and mentors. Alumni on the other hand would get an opportunity to stay in touch with College; find out what is being taught in the latest course; keep up with indus-

try trends; get involved in some stimulating technical discussions, and of course, potentially get first access to some of the world's best graduate talent!

We need you!

It is, however, against the grain of social media to try and organise all this from the centre. We need you to get involved, so please join in by either emailing me at social.media@rsm-association.org or just join the LinkedIn group and start a discussion!

Joel Jackson writes about how rural families in Africa suffer from a lack of appropriate transport and how his early-stage, social business is working to address the problem

A different approach to vehicle manufacture

AFTER graduating from Imperial in 2006 with a degree in computing followed by some time in London and a move to Kenya to work with an international NGO, I came to understand how rural families suffer tremendously from a lack of appropriate transport. The severity and scale of this unmet need inspired the vision for Mobius and my leap into the world of social entrepreneurship.

Africa's \$60 billion automotive market is in its infancy and, currently, the majority of vehicles are imported from more developed nations at high prices. These vehicles are not designed for developing world consumers. Throughout Africa, to most of the population, the costs of owning a private vehicle are prohibitive and public transport is either run-down or non-existent.

The lack of appropriate transportation services means millions of people struggle everyday to gain access to clean drinking water, improved farm inputs, markets to buy and sell goods, healthcare and education. Chronic government underinvestment in roads and public transportation further restricts access to a broad range of otherwise available opportunity.

Mobius aims to reconfigure the system. By creating a vehicle with the key functionality of an off-road car at an extremely low price. We intend to introduce a mode of transport ideally suited to the needs of African consumers to stimulate a new era of socio-economic prosperity for millions of people.

To build an affordable and practical vehicle, Mobius is pioneering a different approach to commercial automotive manufacture. We are eliminating all non-essential components common in most vehicles and fitting standard, off-the-shelf

Life has been exciting for Joel since graduating. Having worked as a management consultant in London for two years, he moved to Kenya to work at an international NGO and now has founded his own venture. With work starting on Mobius Two, he's looking for more potential venture financing and, as he puts it, 'an awesome automotive engineer'.

For more info go to www.mobiusmotors.com or contact Joel on joel@mobiusmotors.com



Four-wheel drive, a tough, tubular steel frame at an auto rickshaw price – the prototype Mobius One.

parts such as engines, brakes and steering within a tubular steel frame to create basic but safe cars.

Our core structural innovation was inspired by sand rails and dune buggies which employ similar frame designs to achieve high levels of durability via a unified, monocoque chassis.

To maximise consumer access to our cars, at Mobius we plan to use the same privatised public transport model that catalysed the spread of the now-ubiquitous auto rickshaws and minivans across Africa. Instead of directly targeting the rural poor (people living on less than \$1 a day who cannot afford any capital outlay), we will sell vehicles to the middle classes who then offer services to communities at the bottom of the pyramid. This is a well-tested method employed to deliver services within a sustainable market-based structure across Africa. Examples include maize mills, water taps as well as existing public transit vehicles such as auto rickshaws, minivans and motorbikes.

Mobius is based in Mombasa, Kenya and we recently completed our first prototype vehicle, Mobius One, to prove that vehicles can be built in Africa using our design methodology. We are now in the design stages of our second prototype, Mobius Two. This will move into production in late 2011.

By the end of 2010, Mobius will employ seven full-time staff and we plan to create over 150 local Kenyan jobs by 2014. As the venture scales over the coming years, we expect to achieve significant cost-savings through factory-level production to reach an ultimate vehicle price level of \$6,000. This means Mobius vehicles will be sold at the same price as a new auto rickshaw but with the equivalent functionality of an off-road car – an incredibly compelling proposition to the majority of potential customers in Africa.

FEATURES

TUMOURS, disease and accidents can sometimes force surgeons to remove bone. But unlike fractures, which mend themselves, when large pieces of bone are removed, the remaining bone does not always heal. This leaves patients with few options to restore their mobility and relieve pain.

Scientists in Professor Molly Stevens' group in the Department of Materials and the Department of Bioengineering at Imperial College are trying to address this problem by developing new synthetic materials. Indeed, they have successfully gained CE mark European regulatory approval for a bone repair material for (StronBone™) in June 2010. Synthetic materials to promote new bone growth can also be combined with living cells and this 'combination' can be inserted into cavities so that the patient's own bone can meld with it and repair the defect.

New field

Strategies to create living tissues in the laboratory, to treat diseased or damaged tissues, are at the core of an exciting new field called regenerative medicine.

Different tissues, however, each have their own complicated structure and each is composed of specific cells that are important for the tissue to function correctly. Bone, for example, contains cells that create proteins and specific forms of mineral that together form a complex architecture. These materials provide bone with its strength, and the cells lend it its ability to self-repair.

Therefore, in order for the laboratory-grown bone that Imperial College scientists are developing to be effective, it will have to mimic normal bone in terms of its cells, organisation and biomolecular composition.

In a study published in 2009, in the

Research brings replacement human bone growth closer

by Dr Eileen Gentleman

prestigious journal *Nature Materials*, the team first described how it coaxed different types of bone cells and stem cells to grow small, 'bone-like' nodules in the laboratory. A state-of-the-art, laser-probing technique, called micro-Raman spectroscopy, was applied to examine the material.

Surprisingly, they found that there were significant differences in the quality of the 'bone-like' material grown from three commonly-used, clinically-relevant cell types. Indeed, 'bone-like' nodules, grown using bone cells from mouse skull with mouse bone marrow stem cells, successfully mimicked many of the hallmarks of normal bone, including having a complex mix of different forms of mineral. On the other hand, the mineral in nodules grown from mouse embryonic stem cells was less complex and crucially lacked mineral and protein interactions at the nano-scale.

The team's discovery of differences in how the various cell types formed 'bone-like' material has opened an array of new research avenues. One of these is to understand how cells grown in the laboratory assemble bone.

The job of examining interactions of tiny mineral crystals that form inside cells with protein fibres has fallen to PhD student, Suwimon Boonrungsiman. She examines the 'bone-like' nodules using transmission electron microscopy. She was the first to notice how the nodules formed from embryonic stem cells lacked the close associations of the mineral and matrix phases – a typical characteristic of normal bone.

To visualise these interactions, Suwimon has focused her PhD work on developing a catalogue of new techniques that allow her to examine both the stem cells and the bone mineral they form at the same time.

Breakthrough

She remarks: 'It's important to ensure that we capture the cell's structures, and the mineral it forms, simultaneously. We've applied a technique called 'high-pressure freezing' to our samples. This preserves the bone mineral while still allowing us to view intricate cell structures, such as the mitochondria.' Indeed, Suwimon's pioneering work and her ability to image how bone is being formed has inspired a new way of understanding the intricacies of how cells bring together the building blocks required to assemble a bone.

Since reporting their initial results on the materials characteristics of the 'bone-like' nodules formed from the different cell types, the team has since begun to ask why cell source matters as it does. Dr Eileen Gentleman, a senior postdoctoral associate in Professor Stevens' multi-disciplinary team and first author of the *Nature Materials* paper says: 'We wanted to understand what it was about the stem cells, from a biologi-

Professor Molly Stevens, 35, (left) has been a professor in Materials since 2004, teaching and researching bio-medical materials. After a pharmaceutical degree from Bath and a PhD, Molly carried out post-doctoral training in tissue engineering at Massachusetts Institute of Technology. Working with her

is Dr Eileen Gentleman, 32, (right) author of this article. She gained her degree and PhD in bio-medical engineering at Tulane University, USA and has been a research associate with Molly since 2005.



cal point of view, that made some form a material that was more akin to normal bone than others.'

To achieve this, the team applied a molecular biology technique, called quantitative real-time reverse transcriptase polymerase chain reaction (RT-PCR), to the cells as they were forming the 'bone-like' nodules. This technique has helped the researchers better understand how the different types of stem cells become bone cells in a process called differentiation.

Differing success

RT-PCR amplifies small genetic sequences that direct activities within the cells and provides an indication of how closely cells grown in the laboratory mimic particular cell types in the body. Elizabeth comments: 'Bone cells should express genes that code for specific proteins present in bone. The embryonic stem cells seem to do this to a much lesser extent than do the bone cells from mouse skull or adult stem cells from the bone marrow under the culture conditions we explored.'

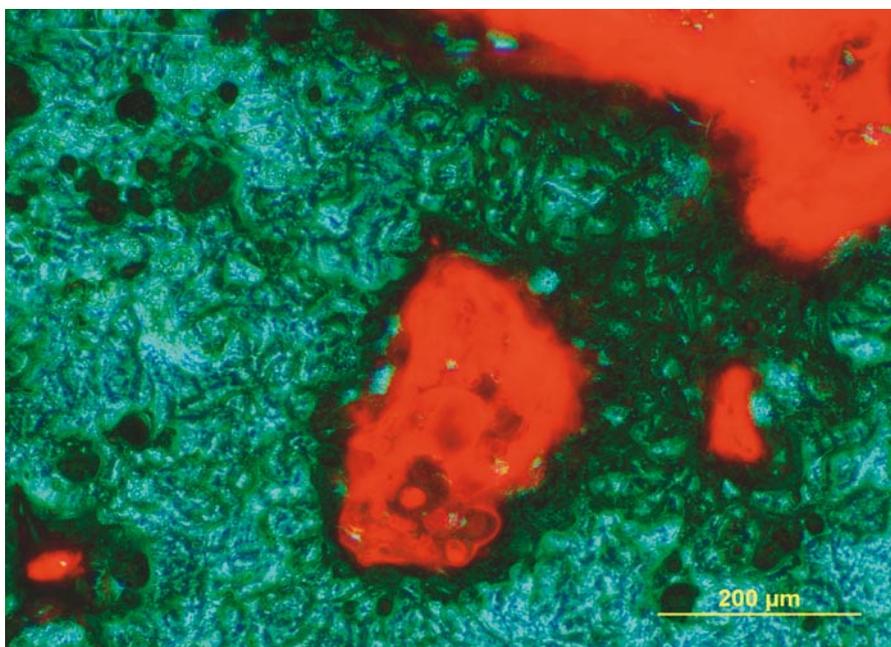
Indeed, their work suggests that it may be far more difficult than previously thought to coax embryonic stem cells to become functional bone cells that can make quality bone.

All three cell types used in Molly's lab are attracting considerable interest as promising candidates for future implants in people. Understanding which ones make high-quality bone that can effectively repair defects may aid researchers in refining their methods, and ultimately their work should help doctors develop the most effective therapies to treat patients.

She says: 'Many patients who have had bone removed because of tumours or accidents live in real pain. By repairing bone defect sites in the body with bone-like material that best mimics the properties of their real bone we could improve their lives immeasurably.'

'Our study provides an important insight into how different cell sources can really influence the quality of bone we can produce. It brings us one step closer to developing materials that will have the highest chance of success when implanted into patients.'

'Molly also added: 'The kind of exciting scientific breakthroughs we are reporting here are only possible due to a really incredibly talented team of



TOP: PhD student Suwimon Boonrunsiman works on the FEI TITAN 80/300 Transmission Electron Microscope in the Department of Materials.

ABOVE: A fluorescence and phase contrast microscopy image of mineralised nodules formed from osteoblasts harvested from a mouse's skull. The mineralised areas fluoresce red, while the unmineralised cell layer is green.

postdoctoral and student researchers. They have come together from backgrounds as different as bioengineering, chemistry, mechanical engineering and mathematics.'

The team's use of micro-Raman spectroscopy to analyse the 'bone-like' material created from the different types of stem cells was also an exciting innovation that arose from the project, and has since prompted the team to apply the technique to other biological systems.

PhD student Kristy Cloyd's work

focuses on heart valve calcification, a common condition in which hard mineral deposits form on the flaps that regulate blood flow within the heart, forcing the heart to work harder to pump blood to the body. She focuses on trying to define the type of mineral in these calcifications and how they form. Kristy says: 'Understanding the biomolecular composition of these calcifications is an important step in trying to figure out how to treat, and ultimately prevent heart valves from calcifying in the first place.'

EDUCATING ENGINEERS

A review of possibly the most important international conference on engineering education. Quickly shortened to E2L, its aim was to discuss how to meet the



SEPTEMBER'S two-day conference at Imperial set out to address the fact that the number of students wishing to study engineering, and then become professional engineers, is declining. This has long worried industry professionals but it is now a source of concern for a wider community.

Compounding this problem, the science and mathematics education of today's school leavers, who do wish to pursue an engineering career, fall short of the expectations of universities as a basis on which to build a professional, engineering education.

Wider discussion

Frequently, this has been discussed in a very broad way, but at E2L, which brought together nearly 130, it was discussed by world leaders in engineering education, representatives of research-led academic institutions, industry leaders and professionals, including those responsible for preparing students for university study.

E2L was opened by Professor Stephen

Speaking after the conference Professor Richardson said: *'E2L succeeded in providing a platform for an impressive group of experienced engineers and scientists from around the world to explore how engineering degrees respond to the needs of industry and society. The university teaching and research community has a role to play at school for university education. The buzz produced during the conference is a positive sign.'*

Richardson, deputy rector and Faculty of Engineering principal. Sir William Wakeham followed with the keynote address on behalf of the Royal Academy of Engineering. Seven themed sessions formed the rest of the programme over the following two days. (See box on righthand page.)

Key topics discussed were -

- a need to be involved in an appropriate network for education development and to share good practice;
- greater educational emphasis on preparing students for global roles;
- greater attention to transferable skills development especially through imparting a clearer understanding of the business culture;
- a need for more industry/academia initiatives and links;
- greater need for inter-disciplinary work in under-graduate teaching;
- a need to encourage further and reward the teaching contributions of academic staff;
- the importance of student-led projects, ie supporting students to follow their own engineering projects and interests which have real world significance.



TOP: Working on a student-led project in El Salvador

ABOVE: Bringing batteries to be charged at an energy kiosk.

RIGHT: Real engineering – an affordable, light-weight wheelchair created from a bicycle.

BELOW: The Imperial Racing Green team with the chassis for next year's all-electric single-seater racing car.

BELOW RIGHT: Practical experience – build your own Gherkin in five days.





ABOVE: Delegates use clickers that students use to give instant answers to questions.

BELOW: Professor Leah Jamieson leads the Overcoming Obstacles theme session.



entation given by Professor David Radcliffe will be finalised.

Currently available on the E2L website are speaker slides, summary slides and reports. A paper on the event, with the aim of identifying current and future needs in engineering education, is planned. Papers on a couple of the sessions are also being explored with the relevant session facilitators. An newspaper article is also being produced to attract wider public engagement.

For further information contact Esat Alpay, Room 2.08, Faculty Building, Imperial College London, South Kensington Campus, London. SW7 2AZ. Tel:+44 (0)20 7594 1567 and email e.alpay@imperial.ac.uk

Current Imperial examples of the latter include e.quinox (the setting up of solar energy kiosks in Rwanda), the El Salvador project (construction concentrating on earthquake proof buildings) and Robogals (energy outreach involving female students)

- To date, responses to feedback on the conference indicate several common areas for institutional change or action –
- being involved in an appropriate institutional network for educational development and the sharing of good practice;
 - greater educational emphasis on global issues;
 - greater attention to transferable skills development (especially through a clearer understanding of the business culture);
 - a need for more initiatives and links between industry and academia .

Early findings

In several cases, these findings were reported as confirming or supporting existing beliefs and practices. In other cases, individuals felt inclined to pursue a new line of development in their institutions. For example, an industry leader will be using new ideas for in-practice training for his engineers. A teacher intends to start practical engineering work with even younger pupils, and has whole-school plans to develop more emphasis on creativity in all areas of the curriculum.

Further reactions to the conference and backing of key E2L outcomes are being collected from feedback forms still coming in and from voting logged during the proceedings. Session material like facilitators' reports and worksheets are also being analysed and the summary pres-

THEMES AND THEIR DISCUSSION LEADERS AT E2L

PROFESSOR ROSS ETHIER (IMPERIAL) RESEARCH-LED TEACHING:

How can engineering education be enhanced by current research in a way that is appreciated by students, be of benefit to future engineers and valued by future employers?

PROFESSOR IAN CAMERON (UNIVERSITY OF QUEENSLAND)

BREADTH AND DEPTH: How can we reconcile the need to develop engineers with sufficient mastery of a specific discipline while, at the same time, having the necessary breadth and 'soft skills' to function effectively?

DR RICHARD FELDER (NORTH CAROLINA STATE UNIVERSITY)

EDUCATIONAL TRANSITIONS AND TEACHING METHODS: Effectiveness of traditional university instruction for new engineering students has always been questionable and its effectiveness seems to decrease with each new generation. Can non-traditional methods be more effective at helping students make the transition from secondary education to engineering school?

SIR WILLIAM WAKEHAM (RAEng) PANEL DISCUSSION:

How can we retain and deepen the interest of students in studying engineering, develop appropriate skill and nurture their desire to develop a career as a professional, having an innovative and entrepreneurial approach?

PROFESSOR LEAH JAMIESON (PURDUE UNIVERSITY, USA) OVERCOMING OBSTACLES:

How can we effect necessary changes; overcome the tensions between research and teaching, create environments where teaching can flourish, invigorating the changes necessary in organisation, culture, evaluation and reward?

DR ANETTE KOLMOS (AALBORG UNIVERSITY) REAL ENGINEERING:

How to relate theory with practice to transition from an academic understanding to engineering as practised. How can hands-on experience be successfully embedded in the curriculum? What is the appropriate way to include in the curriculum areas of current concern to industry, such as sustainability, whole-life costs, energy and climate impact?

PROFESSOR DAVID NETHERCOT (IMPERIAL) EXTERNAL INVOLVEMENT:

Industry panel discussed what role can and should industry and employers play in developing both the engineering curriculum and student experiences to ensure that academic learning is linked appropriately with industrial experience.

Others taking part included Peter Childs, Mike Evans, Daniel E Hastings, Peter Williams, Chris Wise, Andrew Wolstenholme and Johann-Dietrich Worner.

FEATURES

NEWQUAY is an international tourist resort, but in recent years has gained the reputation for being a 'party town'. The economic recession has brought a large number of 'top-end' housing and hotel accommodation projects to a halt, leaving the town, in places, with a down-beat appearance, detracting from the quality tourism product it is trying to offer.

However, it is attracting large numbers of young people throughout the year and has become a haven for unaccompanied 16-17 year olds (U18s) celebrating the end of their exams in late June/early July. There were over 5,000 this summer. Their presence can lead to levels of anti-social behaviour that causes tensions with local residents.

To deal with this, Project Exodus was set up and involves services from Cornwall Council, Newquay Town Council, the police, night clubs and accommodation providers. It provides safe, positive, recreational activity for young people, supervised transport, access to alcohol free clubs and entertainment supervised by the Youth Service. In its first year, Exodus resulted in a 43% reduction in crime for the target demographic (either as the cause or victim of crime).

However, in early July 2009, two young visitors were killed in separate cliff falls in the early hours of the morning. Whilst both tragedies were terrible accidents, there is little doubt that alcohol had a part to play in the deaths. In addition, there were two other incidents where young people received life threatening injuries.

These tragic events attracted significant, adverse, national publicity at the height of the season. This was potentially very damaging to Newquay and Cornwall's tourism trade and the local economy. The publicity and events also caused distress and concern to local

ROB ANDREW has had 'an exciting and varied career in highway engineering,' having joined Cornwall Council. They sponsored him through Imperial where he gained a civil engineering degree in 1987. Management is part of his career progression. randrew@cornwall.gov.uk



Civil engineering to social engineering

Rob Andrew writes about his job as locality manager with Cornwall Council and a scheme designed to reverse the problem of unsafe teenager behaviour

residents. They felt that more should be done to make Newquay safe. Public demonstrations were held and petitions delivered to Newquay Town Council and to Cornwall Council.

Short term fix?

The Council and partners were well placed to respond to this. Within two weeks, members of my locality team, working with partners from the private and third sectors and local community groups, were able to come together and put in place NewquaySafe.



Police and local business people with banners produced for the campaign.

NewquaySafe is a multi-agency partnership with a major long-term mission to turn around the fortunes of Newquay.

I became joint project manager, with the local police superintendent, of this unique social engineering project. Through it I have been able to use many of the project management and engagement skills, learnt in my civil engineering career, to help develop a local solution to help address a national, cultural problem.

Since the summer of 2009, NewquaySafe has developed a programme of short-term initiatives to deal with under-age drinking and anti-social behaviour. In the long-term, we aim to reinstall Newquay as the jewel in the Cornish tourism crown.

NewquaySafe is delivered by a "virtual operational team" of over 15 colleagues from the Council, partners, the private sector and community groups. They work in small teams on the various workstreams within the project. The operational group meets monthly and reports to a steering group of local councillors and stakeholders on a bi-monthly basis.

NewquaySafe and the speed of implementation has attracted considerable positive attention from the media and local and national news agencies.

It was shortlisted for a major local government award after less than three months' work. It has reassured the people of Newquay that partners are working together to deal with the issues and is making a positive difference.

'I cannot believe how quickly Cornwall Council, the police and other partners have come together to react to the tragic events that hap-

pened in Newquay in July 2009' Dave Sleeman, chairman, Newquay Residents Association July 2009

'One of the most solid partnerships we have come across: the strong personal and corporate commitment is second-to-none. Every other area in the country could learn from what is being done in Newquay. It has been a real eye-opener.' Home Office October 2009

Such was the short-term success of NewquaySafe that major national agencies such as the Home Office and Drinkaware are now working with us to pilot ideas on how to change current under-age and binge drinking cultures that affect the UK.

At the time of writing, early August 2010, NewquaySafe has delivered some excellent results in relation to

the annual influx of U18s. In addition to crime and major incidents being reduced, the purge on under-age drinking has made national headlines and was recently acknowledged in a visit by James Brokenshire, under secretary for crime prevention. He recognised that Newquay was doing all it could prevent U18s purchasing alcohol locally, but that the issue lay with parents supplying their children with significant amounts of alcohol to go on unaccompanied holidays.

In addition to rigorous enforcement of ID schemes and drinking in public, over 20 U18s have been returned to

their parents and large-scale alcohol confiscations have been made.

In July 2010 James Brokenshire said: *'I am really please to see how the NewquaySafe partnership is leading the way in harnessing the big society approach, working together to address the issues that really matter to local people and in doing so helping make the area a safer and more enjoyable place to be'*

FOOTNOTE: The season has ended and there have been no accidents.

Lusty Glaze, one of the sandy coves which are a jewel in Newquay's crown, but also a potential danger.



Gabriel Roth, another Imperial civil engineer, writes about a life-time interest

Improving road pricing

THOSE ATTEMPTING to improve road conditions tend to start by seeing the problem as a shortage of road capacity. Further reflection can lead to the idea that the problem might be one of inadequate pricing, especially in congested urban areas. Better pricing has the advantage of helping to solve three problems -

- reduce the demand for road space
- identify opportunities for capacity expansion, and
- attract the necessary finance.

But setting up tollgates at every street corner is not practical.

My interest in electronically pricing the use of roads was sparked in 1959 when I was researching the economics of car parking at the Department of Applied Economics of the University of Cambridge. My qualifications for working there included a degree in economics, which I obtained in the early 1950s, after graduating from Imperial in 1948. Previously I had had a stint at the Road Research Laboratory, doing the fuel consumption measurements required to assess the benefits expected from the London to Birmingham motorway (M1). Incidentally, the government had decided to finance this without an economic assessment.

The 1959 spark was the statement made to a joint committee of the US Congress by Professor William Vickrey of Columbia University advocating electronic road pricing for Washington DC. Prepared in conjunction with the Link

Aviation Corporation, Vickrey's proposal required vehicles to be equipped with 'a self-contained, passive, response block which will provide a unique signal identifying any object moving on the ground to which it is attached'. I phoned Vickrey and invited him to visit England.

At that time Colin Buchanan, who later became professor of transport at Imperial, was working on the monumental *Traffic in Towns* report about transport and the environment in urban areas. Eight transport economists signed a letter to him suggesting that he incorporate Vickrey's ideas in his report. I remember lunching with Buchanan. He was polite and cordial, but declined our request. He said the problem of traffic in towns was difficult enough for engineers and planners without bringing economics into it.

However, Chris Foster (later adviser to Barbara Castle and other ministers,

now Sir Christopher and author of *The Transport Problem*), had friends at the Ministry of Transport. They arranged for Vickrey to explain his ideas, and then established the "Panel on Road Pricing", chaired by Reuben Smeed, deputy director of the Road Research Laboratory, to study the implications for Britain. Its 1964 report *Road pricing: The Economic and Technical Possibilities*, suggested that the idea merited further work. I served on that panel.

Improved road pricing was introduced in Singapore in 1975, in Norway in 1986 and, finally, in London in 2003. London's scheme was introduced quickly to meet the mayor's political timetable, so the technology selected was clumsy.

Payments by users (who pay the same whether they are in the pricing zone for ten minutes or ten hours) do not reflect the costs they impose. Those who pay get negligible congestion relief for their money; and the scheme's operating costs consume some 40% of revenues. Maybe that is why other cities (Edinburgh, Manchester, New York) declined to follow London's example.

Modern GPS-based road pricing systems allow payments for road use to be made as easily as payments for cell-phone use. Charges based on costs can be debited to road users and credited to road providers, thus enabling *all* roads to be tolled, and to be financially sustainable, and without invading the privacy of road users. But they are unlikely to be introduced in Britain until the government allows roads to be treated commercially, and enables road users to pay for the costs they impose and to receive the facilities they are prepared to pay for.

In 1967 Gabriel Roth (Civils 48) joined the staff of the World Bank as a transport economist. Subsequent publications include the 1967 Penguin Special *Paying for Roads: The Economics of Traffic Congestion, and Roads in a Market Economy (Ashgate 1996)*. He also edited, for the Independent Institute, the award-winning 2006 book *Street Smart — Competition, Entrepreneurship and the Future of Roads*. roths@earthlink.net



On these two pages, two groups of students describe overseas projects in part sponsored by The Old Centralians' Trust

Bridgework helps Bolivian villagers

IMPERIAL'S Altiplano Expedition 2009 successfully completed a 24m-span steel truss footbridge and an 8m wooden footbridge. These now allow villagers from Calacala on the Bolivian Altiplano to cross two rivers and reach school and medical facilities. In the rainy season, they were previously cut off for weeks at a time.

AS JUNE faded into July last year, six members of the Imperial College Altiplano expedition arrived in La Paz, Bolivia's capital, to begin steel buying and workshop finding. A week and a half later, sitting exhausted and despondent in a sub-zero hostel room in nearby Oruro, with no steel and no workshop, things weren't looking good. In addition to a lack of suppliers, steel prices had risen sharply and were due to rise again.

Then a Bolivian civil engineer, Dieter, agreed to supply steel and a workshop. The steel thicknesses and lengths that were available required minor design alterations, made more difficult because all steel in Bolivia is supplied in a mixture of metric and imperial.

After the steel was ordered, the team returned to La Paz to rendezvous with the rest of the expedition.

Back in Oruro and, armed with a significant arsenal of cleaning materials, it took two days to clear the workshop, yard and living quarters to begin construction. We slept on roll mats in sleeping bags in one large room. It was sub-zero at night.

With the arrival of the first steel consignment, the workshop was a hive of activity for three weeks. Panels for the steel bridge were constructed one by one, carried into the yard by four people and bolted to the main structure. Meanwhile wood was cut and treated for the wooden bridge.

Obstacles to progress included a

lack of skilled labour and high-powered machines, but with persistence on the part of translators Pilar and Rick, every machine and tool required finally arrived. A big issue was the sheer number of holes required for drilling - over 8,000 including pilots.

port like a seesaw while being winched forwards, without toppling into the river. Once almost on the opposite bank, the bridge rested on a temporary wooden structure, then a metal frame, before finally being lowered onto both abutments using hand-operated hy-



During time at the workshop, four of the team travelled to Calacala to survey and prepare the site. Despite sleeping in tents in a makeshift camp, through heavy snowfalls and -15° degree mornings with driving winds, work was finished in record time. Surveying both bridge sites and building concrete abutments on which the metal bridge would rest were complete.

For transport to Calacala, the steel bridge was dismantled and loaded onto a truck. The bridge panels were then bolted into modules on site according to the codes sprayed on in the workshop. The first six modules were constructed on a temporary steel structure over one abutment, and pulled half a metre towards the opposite bank using ratchet winches. Consecutive modules were added as the bridge was pulled further over, and a water tank was added as a counterweight once the bridge was complete. This allowed the bridge to balance on the temporary sup-

port like a seesaw while being winched forwards, without toppling into the river. Once almost on the opposite bank, the bridge rested on a temporary wooden structure, then a metal frame, before finally being lowered onto both abutments using hand-operated hydraulic jacks. The process of launching took three days, and was fraught with complications. However there followed a fantastic party resplendent with dancing, roasted llama and fireworks.

In parallel with the steel bridge, a smaller wooden bridge and a solar shower were prefabricated and we explained and demonstrated the assembly method to the villagers. Due to time constraints, we were not able to finish this, but two of the team returned to the village three weeks later and found assembly of the wooden bridge almost finished. The structure seemed extremely sound with only installation of decking and handrails needed.

Similarly, construction of the solar shower was underway. As this project was more technical and may involve more complications, staff from our NGO partner CEDPAN agreed to provide any support the villagers may need. They are also able to contact us for advice on any problems.

Expedition members were Naomi Bessey (leader), Harriet Kirk (chief engineer), Thomas Utley (treasurer), Chris Taylor (engineer - structures), Pilar Samper (translator), Ricardo Smith (engineer, translator), Mitch Hensman (engineer foundations), James Falkingham (engineer), Joseph Hale (engineer), Patricia Steven (engineer - solar shower).

IN THE last two years, students from Electrical & Electronic Engineering (EEE), under the name e.quinox, have successfully researched and put in place a scheme to help people in Rwanda.

It focuses on promoting equality by making power accessible to rural communities through a system where renewable energy, such as solar power, is used to charge portable batteries in a central energy kiosk. These batteries can be hired out to local householders in areas without mains electricity, to provide power for a range of uses such as lighting, radios and keeping medicines refrigerated.

Fees from hiring the batteries are channelled back into maintaining the kiosk and providing a salary to local people employed on the project.

In January 2009, a team of four – Christopher Hopper, Tom Luth, Laurent Van Houcke and Mohammad Mansoor Hamayun – went for a 10-day scouting trip to Rwanda to meet local partners – NGOs, local and central government and suppliers – and find a potential community for the first project. During that visit they also learnt, from another organisation’s energy kiosk project, what not to do.

For the idea to work, it is important that the local population backs it because it has been demonstrated that it is cheaper and better than kerosene or candles. In addition, ‘the shopkeeper’

Outlook bright for Rwanda project

who runs the kiosk should be well trained and have an economical interest based on a bonus system. Following that, local authorities need to be brought on board by making them aware of how an energy kiosk can work towards giving Rwandans a better quality of life, much of it through education, because children would have the possibility to study after dark. In turn, backing can be given by the government to meet the objectives of its Vision 2020.

Most crucially, to make a photovoltaic system self-sustainable in rural Africa, one must combine appropriate technologies with appropriate financial schemes and not use state-of-the-art equipment that is not necessarily robust.

e.quinox returned in September 2009 and successfully established an energy kiosk in a village of 60 households in the Minazi Sector of Northern Rwanda. The students had logistical support from development agency the Belgian Technical Cooperation (BTC),

the Rwandan Ministry of Infrastructure and practical help from students from Kigali Institute of Science and Technology (KIST).

Since then, local links have strengthened and the current team is working more and more with students from KIST. This development has been registered as e.quinoc Rwanda and has opened up access to local grants.

This September, a team of 10 students from various Imperial engineering departments, but largely from EEE, returned to build and equip two kiosks in the Kamonyi and Bugesera districts, as well as upgrading the original kiosk in Minazi with around 100 more boxes (effectively 100 more households).

That means that 360 households are being served across the three kiosks. Minazi (below) and Bugesera kiosks are solar powered, while the Kamonyi one is grid connected.



Meeting the e.quinox team in London, Rwanda’s Minister of Education, Dr Charles Murigande, said: ‘e.quinox is a very important and useful experiment for us in Rwanda, because it addresses a very real problem. Thanks to these Imperial engineers there is the potential for people in our villages to have power and therefore the resources and connectivity that are so important in opening up opportunities for development. I want to take this opportunity to congratulate this group of students on a job well done.’

Hydro surveys were also carried out at sites across Rwanda during wwSeptember and plans already in place for power to be water-generated for the first kiosk next year.



Founding member of e.quinox Mohammad Mansoor Hamayun and the project’s new chair Christopher Hopper have collected a US \$10,000 award and the title ‘Student Humanitarian Supreme 2010’ in the IEEE’s ‘Change the World competition’. On behalf of the team Mohammad said: ‘We set out to take on a project where we could apply our engineering knowledge in a way that really makes a difference to people. The plan is to expand it, so it’s fantastic to have this money to help.’ You can vote for them in the BBC 2010 World Challenge competition by going to www.tbeworldchallenge.co.uk/2010-finalists-project11.php

The team taking the project forward involves Christopher, Minas Ioannou, Roger Wei Lang Liew, Var Hansen, Christiana Varnava, Heinrich Lobner, Lukas Lukoschek, Varun Sharma, Duncan Mcnae and Daniel Choudbury. Daniel is vice chairman (information and marketing).

FEATURES

THE LARGE infrastructure of public works which I propose to transform the region of Toronto near my home has many advantages. It would be easily put into effect, of lasting advantage to the economy, a job creator and would use proven technology.

Lakes Simcoe and Couchiching present a water storage area currently of 900 km² and the catchment area of the Severn River, 2840km². Lake Simcoe is 721ft above sea level and log dams at the lake exit control the surface level within two or three feet.

Thirty miles south of Lake Simcoe is the metropolitan Toronto area, which has a large demand for electricity. Toronto, on Lake Ontario is about 250ft above sea level. The 470ft difference in the two water levels offers the potential of an enormous resource of electricity, while the volume of the lake offers huge energy storage capacity.

Water waste

Under the management of the present authorities, and lack of facilities, every year huge volumes of water are wasted flowing down the Severn River during the spring freshet, particularly from the Black River. In August, huge volumes are wasted out of Lake Simcoe. This water bypasses the few small generating stations on the Severn and its energy is dissipated in Lake Huron. Some of its remaining potential energy is recovered downstream from the generators at Niagara Falls, but this energy has to be shared with the US.

Remedy

I proposed the use of Lake Simcoe as a storage reservoir for the water that is wasted every year.

Firstly, redesign of the dams at the north end of Lake Couchiching is

An idea whose time has come

Tony Bridgen (MinTech 62) outlines a sustainable power-generating system ready for Canada's recovery from the recession

needed so that water from the Black River could be diverted into Lake Couchiching and then into Lake Simcoe. Secondly, an underground tunnel 30ft or more in diameter would be needed to feed water from Lake Simcoe to a major hydraulic generating station to be built in the Toronto area. Power can be distributed locally and through the national grid. There is scope for much refinement in the role of the Trent Severn Waterway, including provision for maintaining an appropriate water flow through the Severn River.

Benefits

Among benefits of this scheme are

- providing funding for the future of the Trent Severn Waterway;
- providing a vast new, secure, supply of 'green' electrical energy from a constantly renewed resource;

- stable costs and low risks, both of which may easily be calculated;
- easy development into a 'pumped storage' facility for electric load leveling on a national or international scale;
- employment in difficult times.

Environmental care

The technology to do this work is well-established. Ontario Hydro has already developed a way of drawing water out of a lake through the bottom without affecting the environment. It is used at Pickering power station for cooling water from Lake Ontario. (There are also swampy lands south of the lake where the intake might be located.)

The outfall from the power station would make a river about the size of the Severn. If not discharged directly into Lake Ontario, land developers could be offered water rights to use the outlet water to create new waterfront housing, canals, parks, lakes and similar.

Other advantages are

- seasonal flooding in the lakes and rivers of the Trent Severn Waterway would be more controlled;
- flooding of sod farms in the south end of Lake Simcoe and related run-off of fertilizer into the lake would be better managed;
- eventually, large areas being left by quarries in the Carden plains could be used to store additional water for power generation.

The direct cost of my proposal can be easily calculated. The ramifications and value of the benefits are many, but this article is only concerned with the basic idea, which is sound.

Tony, who also runs a B&B with wife Betty, in on tonybridgens@sympatico.ca



Jet development could have averted WWII!

OUR NONOGENARIAN polymath, Robby Robinson's (Mech Eng 1935) subject concerned his experiences working with Frank (later Sir Frank) Whittle, contemporary inventor with Germany's Hans von Ohain of the jet engine. Ohain and Whittle became friends in later life and Ohain was convinced that, had the RAF paid attention to Whittle when he first advanced the concept, the jet would have been developed in Britain in the mid-30s and WWII could have been averted.

By way of background, Whittle was a cadet at Cranwell in the 1920s and excelled in many fields. He filed his first patent for a jet engine in 1930



but failed to get any official interest until 1935/6 when Power Jets Ltd. was formed to develop the concept.

Jet powered

In the late 30s, Robby, freshly graduated from Guilds, was working at the Bristol Aeroplane Company when war broke out. In 1940, he joined Power Jets who by this time had moved to Lutterworth and, unsurprisingly, were very closely "managed" by the Air Ministry, whose interest in the technology had been concentrated by the war.

Even so, funds were limited and Robby provided an interesting anecdote regarding the search for starter engines for the jet machine. Electric starter motors of the time were insufficiently powerful for starting a jet turbine and, consequently, a petrol engine was needed. Robby was sent on a mission through Coventry to retrieve

two Austin 7 engines for this purpose – the mission accomplished through the wreckage of a bombed city.

The challenge of producing a viable engine was not primarily thermodynamic. Proof of principle had been easy; what was difficult was finding the alloys capable of handling the temperatures in the engine. A related challenge was finding an insulation material to protect the airframe from these high temperatures.

This is where "you couldn't make it up" comes in. Knowing that crumpled aluminium has a relatively high melting point and, because it can immobilise air in its folds, it makes an excellent insulator, the team contacted a scrap merchant who, among other things, collected discarded cigarette packets in London. He provided sufficient material which, when wrapped in chicken wire, provided enough of a heat shield to ensure the prototype aircraft was not consumed in a fireball.

Work continued apace and, in spring 1941, prototype testing began. History was made when, on May 15 of that year, the Gloster E.28/39 took to the air at Cranwell. The maiden flight reached a speed of 350mph at 17,000 feet, well in excess of the Spitfire and other state-of-the-art propeller fighters. Making up for lost time, the Air Ministry poured in resources and the Gloster Meteor, the Allies' first jet aircraft, went into production in May 1944, only a few months later than the Messerschmidt 262.

Its first task was to chase V1s (Doodlebugs) and tip their wings over. Unfortunately, the V2 was too fast even for the Meteor and the aircraft were deployed elsewhere. The Meteor saw service in many theatres in the post-war period, with the last being retired in the 80s.

Robby shares von Ohain's view

that officialdom's early indifference to Whittle's invention was inexcusable and more timely action could have changed history. It might have resulted in the eclipse of the Spitfire, however!

In the post-war years, the same officialdom made up for its neglect of Whittle with a knighthood and a £100,000 award in 1948. Many other international honours followed, culminating with the Order of Merit in 1986.

Century best

Robby believes Whittle to be the best engineer of the 20th century, but as he mischievously commented to his Bletchley Park audience, 'in the presence of Alan Turing, who was the best inventor?

The Reactionaries, a social society of which Robby is a member, was formed by the 147 members of the development team. They met regularly as close to May 15 as possible to commemorate the maiden flight of the Gloster E.28/39. Their last meeting was on May 15, 2001 (Diamond Jubilee). The name came, not from any philosophical proclivity, but from the propulsion mechanism of the engine. Long may they react!

LEFT: Robby in full flow.

BELOW: Sir Frank in later life with his son.



THE RICHES BENEATH OUR FEET: How Mining Shaped Britain

BY GEOFF COYLE

Published by Oxford University Press, 2010, pp267 £20, USA \$35.1
SBN 978-0-19-955129-3

GEOFF COYLE'S book tells the fascinating story of Britain's mining industry. It describes in detail how the industry developed and the impact that it had (and still continues to have) on Britain's social and physical landscape.

There is something within us all that loves facts and, particularly ones that take a problem through necessity, ingenuity, discovery and invention to the point when it emerges as an object/product/system we know and use today. Geoff describes the innovations along the way; how mining shaped the social life of our near-ancestors; formed and fashioned our landscape, and how it contributed, and still does, to the world of minerals, engineering and industry.

It has often been observed that a country's (or a region's) mineral resources—given a few exceptions—are proportional to its land mass. These exceptions include South Africa, the Carlin Trend in Nevada and indeed Britain. Whilst one could debate such a back-of-the-envelope statement, there is no doubt that Britain was blessed with a share of the world's mineral deposits significantly beyond its relatively small surface area. This is due to its complex geological past, which has resulted in a remarkably varied geology for such

BOOKS

a small island. This geology harbours the country's wide range of mineral deposits from the salt under Cheshire, nickel in South Wales, gold from Scotland, graphite in Cumbria to iron ore in Kent, to say nothing of its seemingly ubiquitous surface and underground coal deposits.

Geoff starts by describing the very earliest pit mines where primitive man used deer antlers and fire-hardened wooden stakes to hand-dig shafts and tunnels to harvest flints. These were crafted into axe ends, arrow points and even embedded along wooden sticks to act as the teeth of rudimentary saws. However, it is the coming of the Industrial Revolution which propelled Britain from its position of miner minnow to mineral giant of the world.

Mineral variety

Coal was mined by the Romans, but it was not until the early 17th century that it became significant, eventually directly employing over a million men. Iron mines in Cumbria and Cleveland fed the shipyards and steelworks of Barrow-in-Furness and the Durham coast towns, and those of the Midlands were the basis of great industries in Birmingham and Sheffield. The discovery of copper in abundance coincided with its use as a means of sheathing the hulls of ships against the wood-bor-

ing teredo worm and clinging weeds that reduced speed and manoeuvrability. Indeed, one could with justification, say that this development helped Britain to rule the world's waves (both military and commercial).

This highly entertaining and absorbing book goes beyond the obvious history of coal mining in Yorkshire and the tin mining of Cornwall to look at the impact of slate mining in Wales, arsenic and uranium as a by-product of mining in the West Country, lead mining in Derbyshire and the extraction and use of dozens of other minerals. Indeed it makes one wonder how Britain would ever have developed to a point where it conquered, ruled and administered the world's greatest empire without so diverse a 'home-grown' source of minerals.

However, it is not just the mechanical challenges of these mines and the workings conquered by these generations of miners that the author follows. He also describes in considerable detail the hardship, squalor, disasters and heartbreak which unfortunately all too frequently went hand-in-glove with the lives of working men, women and children associated with this country's minerals industry.

Geoff Coyle (RSM 1959) worked for the then National Coal Board before a career in academic operational research. Now retired, Geoff remains active in consultancy and as visiting professor to universities in the UK and Australia.

Peter Darling

WHOLE EARTH DISCIPLINE

BY STEWART BRAND

Atlantic Books

ISBN 978 1 84354 815 7

STEWART BRAND (SB) is impressive. He trained as a biologist but also spent time as an army officer. He might reasonably be described as a contrarian – someone who goes against the conventional wisdom. His book charts his conversion from environmentalist to 'ecopragmatist'.

I first became aware of him through his award-winning *Whole Earth Catalog* publications in the 1970/80s. They detailed a philosophy of self-reliance, and promoted the idea of communes.

The detail of his conversion is fascinating. I found the chapters on 'City Planet', 'New Nukes' and 'Planet Craft'

particularly interesting. Part of his thesis is that cities should continue to grow, and that this is good for both humanity and the planet. The main attraction of a city is the economic benefit of mass propinquity and is one of the reasons why cities have worked well in the past.

The idea of the commune has largely moved out of fashion but, taking a contrarian view myself, I suggest they may be due for a modified revival. The development of efficient small scale 'green' energy supply systems (package nuclear reactors) are beginning to make smaller communities more attractive; the mobile telephone system has totally altered the idea of propinquity. Haiti in recovery may prove to be a trendsetter.

To put some engineering flesh on the idea of 'community' nuclear reac-

tors, figures were quoted recently in *Fortune* (March 22 2010). A 25MW reactor would cost around US\$40 million and supply an American community of 20,000 homes at a cost of 10 cents per kWh. It would measure 8ft(H)x5ftx5ft and be buried 15 ft below ground. SB mentions a reactor as small as 10MW.

Further support for SB's energy supply ideas comes from James Lovelock, of Gaia fame, who endorsed nuclear power at a recent meeting of the Royal Society in London.

I quote from SB's summary – 'Ecological balance it too important for sentiment. It requires science. The health of natural infrastructure is too compromised for passivity. It requires engineering'. www.sbnotes.com

Bill Bradford

Adventure needed

WHILE turning out his attic, Tony Greenfield found this photograph of the 1950 RSM rugby team.

Pictured are, back row, AA Greenfield, JH Saunders, EA Millard, WS Robinson, LA Hill, JA Pash, BTK Barry. Front row, DB Fraser, OJI Evans, ME Penstone, A Dunning, DG Norris, NH Townend and JFC White. 'The 15th member, a right prop, is missing and I can't remember his name,' says Tony.

If you know his name, are pictured or know anyone who is, please contact the editorial board and Tony.

'I need an adventure,' writes Tony. 'An adventure is an active holiday that is not planned, except for going and returning. I have walked in many jungles and up many mountains. Most of my adventures have been alone, or with one or other or both of my sons. I want to visit the jungles, mountains and scenery of Venezuela and am looking for a good companion. I need an adventuring companion, preferably one who is tough and keeps smiling. I fly and then see what's next.'

Contact Tony if you're also looking for an adventure on tony@greenfieldresearch.co.uk

ALUMNI NEWS

Five pages of who's doing what and where



Hike beats weather

IT WAS a rather blustery day in May when 13 stalwarts of the ICAA of Northern California, from as far away as Santa Cruz and Davis, met for our annual hike.

With clear blue skies, we enjoyed typical English spring weather and shared a convivial, lavish picnic. John Mashey's birthday was celebrated with a carrot cake and we wished Mary Goodman a great day on Monday.

After groaning to our feet, some of us were rewarded with magnificent views and the sighting of a flock of wild turkeys at Lafayette Reservoir.

Howard Wise

howard.wise@attglobal.net



Two ways to achieve the same ends

Chinyelu (known as Chi) Onwurah (EE 87) writes about why she left engineering to become an MP

OFTEN during the General Election campaign I was asked (to paraphrase):

'Engineers are intelligent, professional people who build and make things. Why on earth would you give that up to be a politician?'

Obviously, I was campaigning in the North East where engineers have long been admired and respected even though elsewhere our reputation has been lower and dirtier.

My answer was that for me engineering and politics have always been two different ways of achieving the same ends – making the world a better place. I studied engineering at Imperial because I believed it would lead

to a fulfilling career where I would be able to spend my life building things, solving equations and playing with engines. I was almost entirely right.

My career has covered hardware and software development, systems design, large scale project management, market development, product strategy, consultancy and regulation. It has enabled me to live comfortably across three continents and five countries – UK, France, US, Denmark and Nigeria.

But I have always known that whatever the problem, engineering was only part of the answer. For example I can design the perfect superfast broadband network. But only



politicians can ensure that it is built, and once built, used.

So when the opportunity to stand for Labour in my home town of Newcastle came up, I knew I could do more as an MP than an engineer. After four months in the House, I know I made the right decision.

Though that doesn't mean I think engineers do all we can. The lack of engineering knowledge in the House is quite striking. The profession lobbies to influence parliament but I think we need to do a lot more to be more effective. Part of that is better representing the diversity of the UK – more women, black and ethnic minorities and the less privileged.

And part of that is being more articulate about what we do. All sides of the House accept we need more engineers and more engineering skills. We should be leading the debate on how to make that happen.

Chi is now shadow minister for innovation. Ed

Grant to climb from CCS to Kilimanjaro for Wellchild

GRANT BUDGE, right, a mining engineer from the vintage year of 1993, has signed up to ascend one of the largest volcanoes in the world in aid of his favourite charity Wellchild.

He has no experience in climbing mountains so Kilimanjaro is a massive challenge. However, he is appreciative of the pain ahead, having completed two London Marathon's on behalf of Wellchild.

'WellChild is a fantastic charity,' says Grant. It focuses

on delivering care and support to children and their families in the UK who are ill and in need, as well as researching to improve treatments, immunisations, programmes and surgical techniques.

Grant is aiming to raise £6,000 in sponsorship and has set up a 'justgiving' web page www.justgiving.com/Grant-Budge. Training began in earnest in March and the climb will take place at the end of this year.

Since his MSc Grant has

worked in mining and steel, but is now project director for Powerfuel Power's clean coal power station project in South Yorkshire. The project is one of six European carbon capture and storage (CCS) demonstration projects awarded European funding in 2009 under the European Energy Package for Recovery. The project is a 'pre-combustion capture' project and the only one in Europe looking to deploy this kind of technology.



Community service award

Professor Dick Selley, (Ph.D 1963) Senior Research Fellow in the Department of Earth Science and Engineering, has been awarded the 2010 Coke Medal by the Geological Society of London. The Coke Medal is awarded annually 'to acknowledge a substantial amount of research and service to the community.'

r.selley@imperial.ac.uk

Another Spanner comes home

WHEN Jenny Jones was elected CGCU president in 1974, it wasn't possible for her to raise Spanner (traditional mascot with Bolt) over her head for the Boomalaka chant. So it was decided to make a wooden replica.

'To this end, Spanner spent the summer holiday, with me, at my parents' house in Plymouth,' Philip Northey (Chem Eng 1975) wrote recently.

'There I made a replica spanner out of a wooden plank and then painted both so that, from a distance, it was difficult to tell them apart.

'However a look at the person holding the Spanner quickly revealed which one was which (the one hoisting the brass one usually sweating, shaking and with bulging veins on the temples).

'From the start of the new

term Union meetings would end with Jenny holding aloft the replica and Dave Barnes (vice president) holding the brass spanner over his head with one arm while I stood in attendance, just in case.

'At the end of the year, which was my final one, I was given the wooden Spanner as a memento.'

Having seen the picture of Dan Lundy in similar pose in the last *Imperial Engineer*, Philip contacted the Union. It was, of course, of great interest to the current executive and Philip met president He-in Cheong to hand it over (below).

pjnorthey@btinternet.com



ABOVE: Philip with He-in. RIGHT: A 1974 picture sent by Philip so that friends may recognise him and get in touch!



'T'Ain't What You Do (It's The Way That You Do It)

THE TITLE of the Jazz classic, written by Sy Oliver and James Young, and made famous by Ella Fitzgerald, could be used to describe one of the major changes in project management in recent years.

In 1975, my first solar energy project arrived care of a manufacturer in south west England who needed to test various designs of evacuated tubes. Then a second year undergraduate, I found myself spending many a sunny afternoon on the roof of

Mech Eng – it was tough job but someone had to do it.

A decade later I was looking at the R&D process from the other end. This time I was the one sponsoring the research and a final year undergraduate, George Bouziotis, was assessing the feasibility of using photovoltaic arrays to power hydrogen generation plants in desert regions – an idea that had been put forward by a Dr Robert Dahlberg in Heilbronn, Germany.

Two years ago, with oil prices on the rise again, I decided to take another look at capturing solar energy: this time to heat air in a glazed area of a house and circulate it through the rest of the building. The system would also be used to heat the earth around the house in an effort to increase the efficiency of a ground source heat pump.

However the project differed markedly from the formal ones I had previously been involved in. Of course, it is the internet

that has driven this change, supporting, as it does, collaborative working and idea sharing. Working with a development partner in Dakota, without leaving my armchair, has helped drive the project along and avoid costly mistakes.

There are important issues with this style of working – a key one being intellectual property rights – but it has certainly jazzed up R&D.

Peter Kruger (Mech Eng 76)
www.theenergycrowd.com

Harry helped automobile race

PROFESSOR Harry Watson (Mech Eng 62, 66, below left) receives the Federation of Automotove Engineers 2010 medal from its president. The citation recognises Harry's outstanding contributions to the development



of automotive engineering, by focusing on the chemistry and physics of internal combustion engine processes. Practical experience led to a PhD at Imperial on reaction kinetic rate constants for hydrogen combustion in engines and, thus, under-standing for the first time the role of chemistry in the HCCI engine process.

Harry taught at Melbourne Univeristy and is a fellow of the Academy of Technological Sciences and Engineering. Among others he has consultancies with Formula 1 engines and body design.

Gold strike recognised

RICHARD GARNETT (right) Min 57, Geo 62 and ICU president (1958-9,) has received the Canadian Thayer Lindsley International Discovery Award for his earlier discovery of the giant, Alaskan, Donlin Creek gold deposit. It's now thought to contain 42 million ounces.

His citation noted that he later played a leading role in the discovery and initial evaluation of the hugely-important Voisey Bay nickel-copper deposit, in Labrador.

'There may be some readers who remember me and would like to get in touch', says Richard in Toronto. valrik@cogeco.ca



EE 1970 celebrate in style

TWENTY TWO of the active Elect Eng class of 1970, plus family and friends, met on September 25 to celebrate 40 years from graduation, write Bob Mack and Simon Maddison.

The programme for the day was put together very much at the last minute as we had originally intended to piggy-back on the scheduled Alumni Day, they write. They gathered at the Queen's Arms (echoing annual 'planning' meetings) and head of EEE Peter Cheung gave an entertaining and informative tour of the department followed by

a talk with tea and cakes. Continuing investment in the department was clear as was Peter's determination that upgrades should respect the heritage and materials of the building.

They continued: 'We then had a very interesting, professionally guided walk, with an electrical emphasis, from South Kensington to Piccadilly.

'The walk finished at the RAF Club where we encamped in the bar before a splendid meal in one of the private dining rooms. The food was good and the service excellent – it was great to be

able to eat, drink and chat at our leisure. The entertaining highlight of the evening was a draw to win a rather personal Philips product for which Lorcan Smith pioneered the electronics design. We await a test report back from the winner.

'Present were Ray Ball, Peter and Maggie Banbury, Dave and Jennifer Bertenshaw, Rod Brook, Richard Cole, Alan and Geraldine Couchman with Lorraine, Brad, Peter and Gillian Delow, Sandy Eames with Alex, George Faris, Suzanne and Mike Flynn, Christine Havelock, Ken Hewitt, Dave Hoare, Kev and Sam Hodson, Jim Lee, Pete and Sue Lockwood, Bob Mack, Paul Mellor, Simon and Barbara Maddison with Felix and Tara, Andrew Papaspyru, Fred Pew with Erica, Ranko Sarajcic with Iva and Lorcan Smith.

The gang at the Wellington memorial.

Contact needed in the Amazon

'I'D LIKE to know where my classmates are now (MinTech 71)', writes Ian Dun from South America where he's been for 32 years, until recently in Peru. 'I'm working with Mineracao Taboca on the redevelopment of an interesting Sn, Nb, and Ta mine in the Amazons.

'I work 20 days on and 10 off, returning to Rio de Janeiro. If anyone is in this part of the woods please do look me up.'

Ian Gordon Hall Dun

Correction

A FRIEND has drawn my attention to an error in my e-mail address shown in the last *Imperial Engineer*. It would be a shame if somebody tried to contact me unsuccessfully,' writes Ernest Grossman. 'The fifth letter should ofcourse read j not i.' Ernest Grossman (Mech Eng 52) eandjgrossman@waitrose.com



Alan calls for the class of EE 1981

2011 will be the 30th anniversary of the graduation of Electrical Engineering class of 1978 to 1981 and they are making a special effort to trace and contact as many of their former class as possible in readiness for a big reunion in 2011.

'So far we've traced 55 out of the 77 in our class, says Alan

Higginson. 'We've also formed a LinkedIn group which already contains 25 of the 55 we have traced. They held a mini reunion on September 25.

Anyone from the class who wants to be kept in touch or meet at the 2011 reunion should email Alan on alan.r.higginson@btinternet.com

WE NEED YOUR NEWS

Let us know your news and stories.
Or have you an idea for a feature?
Editorial assistance is available!

Contact is Teresa at t.sergot@imperial.ac.uk

IDEAS FOR NEXT ISSUE BY NOVEMBER 26

We've changed the date to just after you receive this issue so that you can let us know your news really early. Even if it hasn't happened yet, let us know so we can schedule it in. If you send news after this date, we'll do our best to include it.

FINAL COPY DEADLINE MARCH 18

OBITUARIES

IN THE EARLY 1950s, Australian David Warren, who died on July 19 aged 85, happened to be interested in using new, smaller voice recorders to record jazz concerts from his top pocket. He was principal research scientist at the Aeronautical Research Laboratories (ARL) in Melbourne.

Then a Comet passenger plane crashed on take-off in India, killing 11 people. After two more Comet crashes, a committee was formed to look into possible causes and David was asked to work with it.

A few weeks before the committee began work, David Warren had seen the world's first pocket-sized recorder, the Minifon, which used wire to store information (plastic tape was invented later). He began to think it would be useful to

have a recording of flight crews and their instruments.

It would be good to say that, as a result, he invented his orange red 'Back Box' and that it was immediately installed in aircraft round the world. But it was not that simple.

The idea was rebuffed by his boss and in Australia, because the authorities said it would record more expletives than explanations. Pilots likened it to Big Brother spying on them.

As Australia had a good air safety record, there was 'no need' for his appliance, according to the Australian Department of Civil Aviation.

Then Sir Robert Hardingham, the secretary of the UK

Air Registration Board saw the device. He promptly flew David to Britain and a production version of the device was developed. The full commercial exploitation of the Black Box was by a US Manufacturer.

David Warren received many awards for his Black Box, and was awarded the Order of Australia in 2002. He said he had no regrets at not making any money from his invention!

David fame followed a science honours degree from Sydney and a PhD in fuels and energy from Imperial's Department of Chemical Engineering.

He first taught science and, in 1947, began lecturing in chemistry at Sydney University. In 1944, he married Ruth and

was with her for 62 years

David, who was the first European child to be born on remote Groote Eylandt, had been given a crystal set by his father, just before his died in one of Australia's earliest air disasters in 1934.

David became more and more interested in its possibilities and built radios as a hobby and enrolled for the exam to become, he hoped, Australia's youngest amateur operator.

Unfortunately, when World War II started, a ban was put on amateur radio so he concentrated on his other hobby, chemistry.

*For more about David Warren, see the Sydney Morning Herald's complete obituary.**

Black Box inventor dies

Imperial's popular rector

LORD FLOWERS, who led Imperial for 12 years from 1973 was one of its longest serving and most popular rectors. A physicist, Brian Flowers died at the age of 85 on June 25.

You can read other people's memories and share yours at <http://bit.ly/cD0g6g> *

Lifelong OC man

PETER MOSER died on April 4 aged 88. He read mechanical engineering at City & Guilds, graduating in 1941.

'My Father had a whole file of Old Centralian newsletters and invitations, and often referred to his time at City & Guilds,' wrote his son David.

Electrical engineer remembered

PETER COUESLANT died peacefully on September 3 in Royal Bournemouth Hospital, aged 91 years. He qualified in electrical engineering in 1939. He will be fondly remembered by his son Michael and his friends.

A very civil engineer

DR LINDEN JOHN MORRIS, a life member of the CGCA, died on July 11. He gained a BSc in civil engineering and a DIC in 1964.

A Welshman through and through

DESPITE spending half his life in Scotland, David (Dai) Smith, who died last May, was a life-long promoter of the Welsh culture. He organised singing festivals for the Welsh Society in Scotland; studied the Welsh language for many years, and was appointed president of the Glasgow Welsh Society.

An enthusiastic singer, he was also an accomplished amateur actor, a lover of Shakespeare and a good comic. Dai was a keen rugby follower and in his younger days played for London Welsh's second team.

Born in 1923 Dai was an apprentice at BTH Rugby after which he studied at Imperial until war interrupted his studies. He served as an engineer officer in the Fleet Air

Arm and completed his civil engineering degree after the war.

His work took him to many places in the world, in particular to Turkey, where he was involved in the re-construction



of dams, and to India where he was responsible for supervising large construction sites which were funded by the World Bank to whom he reported.

Dai moved to Scotland with his wife Betty in 1967 and worked with PE Management Consultants. After a little time he set up Smith & East Management Consultants, specialising on advising industry on energy conservation.

Dai was a member of Killeam Kirk, Probus and Neighbourhood Watch and was a founder member of the Strathendrick Singers and appeared in all their productions. Classical music was his great love. Bach's B Minor Mass, brought him solace in his final years.

With his spectacles habitually pushed up on to his forehead, Dai was for many years a stalwart of village life. He was regarded as the patriarch by his large family.*

Guildsman who spent a career at Imperial

DR FRANK ELLIS, who died on September 3, aged 91, had a connection with Imperial College spanning around 40 years.

He was a student and member of staff until retirement in 1982. 'Imperial was therefore a very important component of our Father's life,' writes his daughter Jane Filby.

Frank graduated with a BSc

in mechanical engineering in 1949, with the best results of his year. He was awarded the Bramwell Medal.

Following his first degree, Frank became a lecturer in mechanical engineering. In 1961, Frank gained his PhD, having received a Clayton Fellowship to study. His thesis was on 'Plastic Flow in the Metal Rolling Process'. He also

received his DIC in mechanical engineering – applied mechanics. He continued teaching part-time for around three years after retirement.*

More complete versions of obituaries, marked with an asterisk *, can be found on the website address published on page two.

LIEUTENANT Neal Turkington, 26, who graduated with an MEng in civil engineering in 2007, was one of three soldiers who died on July 13 in Afghanistan after an attack by a renegade member of its National Army.

Professor David Nethercot, head of Civil and Environmental Engineering, said: 'Neal was an outstanding young man, of exceptional potential and rare attitude and civility. He was particularly passionate about using his technical skills in support of others, as reflected in his involvement in expeditions to provide basic infrastructure to the poor in Nepal and El Salvador.'

Tributes to Neal, from the

'An outstanding young man'

men he led and his commanding officer in the 1st Battalion the Royal Gurkha Rifles, refer to his ambition for his troop; the trust they had in him; his integrity and raw ability; the twinkle in his eye, and the ability to bring lightness to the gravest situation. They also appreciated his Nepali which was delivered with a Northern Irish lilt.

Neal, always intent on a military career, went straight to Royal Military Academy Sandhurst after graduating. After joining the Gurkhas a year later, he spent time in Brunei and Nepal before serving in Afghanistan as a junior commander and leader.

For more about Neal see *The Reporter* blog: <http://bit.ly/aQS8Dq> and its link to the Ministry of Defence.



He made major contribution to education

GEOFFREY CHURCH, who was born in Sheerness, Kent, died on August 6, aged 89.

Geoff took an engineering apprenticeship at the Royal Naval Dockyard and from there won a Royal Scholarship to Imperial. He obtained a BSc with first class honours despite many nights spent on the College roof, fire-watching during the Blitz.

In 1942 Geoff joined the Army and was commissioned in the newly-formed Royal Electrical and Mechanical Engineers

(REME), eventually serving as a major on General Auchinleck's staff in Delhi.

After war service, he began a highly-successful career teaching engineering in further education colleges in Portsmouth, London and Staffordshire.

He was a chartered member of the Institute of Mechanical Engineers and co-wrote, with Ron Paradise, two text books – *Strength of Materials* and *Examples in applied mechanics for national certificate students: sec-*

ond year. In 1961, he moved to Lincoln to become principal of the Technical College. He successfully led it through a period of great expansion and change, and made a major contribution to education in the city and further afield.

Geoff retired in 1981 and was a voluntary guide at Lincoln Cathedral until he was 80. A member of Lincoln Rotary Club, and was president in 1988/89.

He is survived by Marjorie, his wife of over 67 years.

Sporting star and polymath

DR ANTHONY COLLINGS, chemical engineer and welter-weight champion, died early this summer. He was born in 1937.

Tony Collings had great skills as a scientist, engineer, sportsman, naturalist, anthropologist, musician, artist, writer, actor, raconteur and caricaturist. Added to these, he was a committed humanitarian and a generous friend. He was also an accomplished caricature artist.

Tony's sporting prowess was obvious at school where he was boxing champion in the various weight divisions as he grew, was a champion runner but also president of the debating society.

After a cadetship with Union Carbide studying chemical engineering, Tony took a part-time degree at the University of New South Wales. He graduated

with honours in 1963, kept up his boxing, athletics and rugby, and was awarded a boxing blue. He was UNSW's sportsman of the year in 1960 and was a finalist in Australia's Olympic boxing trials. He was the NSW welter-weight champion in 1958 and 1959 and again in 1973

After a diploma and PhD (chem eng) at Imperial in 1966. Tony went to the Institute of Technology, California and ANU in Canberra before returning to Caltech a senior Fulbright fellow. He later completed a BA with honours in anthropology.

Tony was boxing coach at Sydney University and continued his association with sport at UNSW. He was twice *chef de mission* of the Australian team for the World University Summer Games (1985 and 1987) and

team manager of the World University Cross Country Championships in 1998 and 2000. At the time of his death, he was chairman of the Commission for Sports Regulation (FISU). In 2003, he received the OAM 'for service to the management and administration of university sport'.

In the late 90s Tony, with Dr John Lowke, led an important initiative in artificial photosynthesis, and was the driving force behind the Australian Artificial Photosynthesis Network

His most recent work and the closest to his heart was the use of high-power ultrasonics for the in-situ remediation of soils contaminated with PCBs and other nasties. This work is now nearing a commercial feasibility trial.

Well-loved professor mourned

PROFESSOR Sir Hugh Ford, who died on May 28, was a founder fellow of the Fellowship of Engineering, now the Royal Academy of Engineering. After a brief period as technical director of waterworks engineers Paterson Engineering,

Sir Hugh became a reader in applied mechanics at City & Guilds, where he had studied from 1934 to 1939. He receiving his degree in mechanical engineering and ACGI in 1936, DIC in 1937 and PhD in 1939. In 1966, Sir Hugh became professor of mechanical engineering and head of department at Imperial College. In 1978, he was made Pro-Rector and retired in 1980.

The breadth of Sir Hugh's interests and achievements may be judged from a biography dated 2008 that can be viewed on the Institution of Mechanical Engineers' web site at <http://heritage.imeche.org/historyimeche/pastpresidents/president/SirHughFord.htm>

A life member of CGCA, Sir Hugh served as its president in 1973-74 and retained a keen interest in it well into his 90s.

Sir Hugh (left) speaks to Dr Frank Ellis at his retirement. See obituary, facing page.



Esteemed alumnus

DR ROBERT Turtle died on July 23. 'He was an esteemed member of our alumni group in Sydney,' writes Bill Macmillan. 'Bob was a graduate in chem eng from Sydney University and took his PhD at Guilds in the same subject between 1949 and 1952. He spent most of his working life with ICIANZ at their Botany NSW complex.'





Imperial ENGINEER

**NEW CGCA PRESIDENT
RSM UNION REINSTATED
ENGINEERING EDUCATION
FOR THE FUTURE**

ISSUE THIRTEEN AUTUMN 2010

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