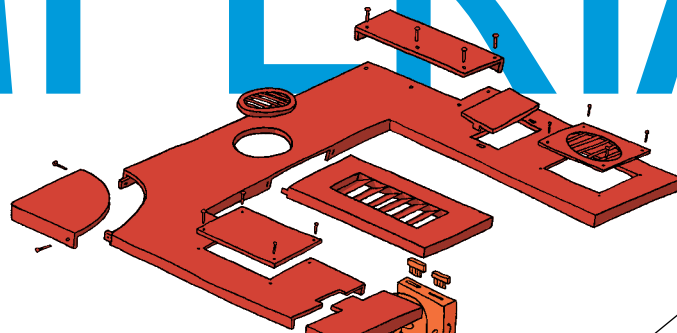
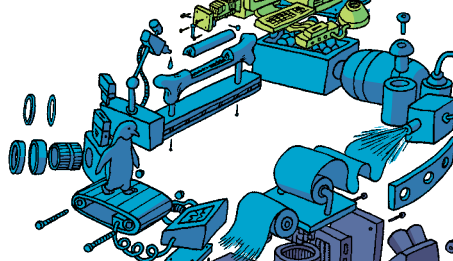
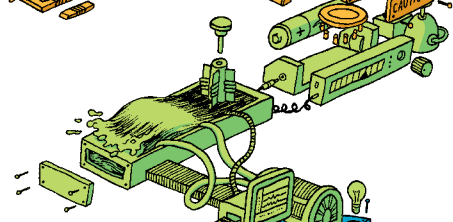
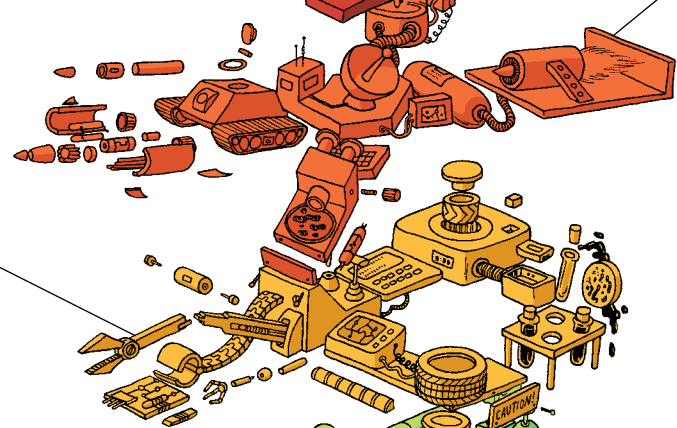


# IMPERIAL



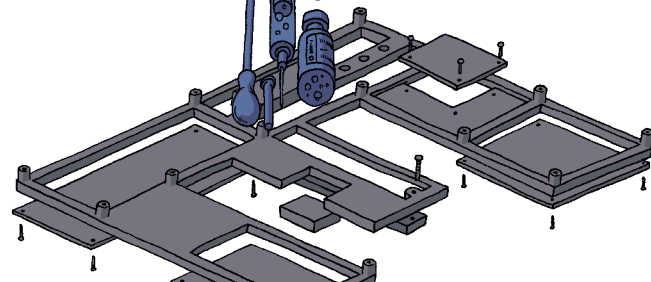
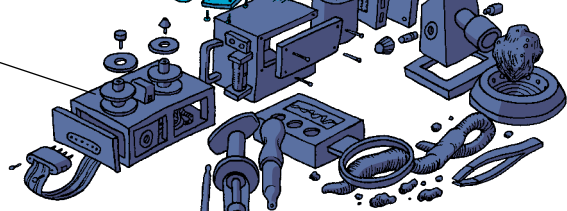
**WAR ZONE**  
*Where innovation  
is forged?*

**GENERATING GENIUS**  
*The summer schools  
changing lives*



**SPRAY ME**  
*Haute couture  
chemistry*

**DAVID WARREN**  
*The maker of the  
black box*





12

### 3 Rector's welcome

### 4 Inbox

Editorial and contributors

### 5 In brief

Spotlight on recent events and discoveries

### 10 Product pipeline

#### ATTENTION TO DETAIL

Spin-out technologies for seeing in new ways

### 11 Question time

#### ON THE MOVE

Transport experts advise on future priorities for getting around London

### 12 Carering ahead

#### FROZEN MOMENTS

Photographer and explorer Phil Wickens describes his wild career on ice

### 13 Campus life

#### SOCIAL SCIENCE

*Felix* editor Kadhim Shubber writes on social networking and life in the Library

### 14 Feature

#### GENESIS OF GENIUS

Equal access to higher education is a priority for financial analyst alumnus David Pollard

### 18 Picture this

#### SPRAY-ON SCIENCE

Science goes out in style as spray-on technology goes from lab to catwalk and chemical engineering meets haute couture

### 20 Feature

#### TECHNOLOGIES OF WAR AND PEACE

New thinking from David Edgerton reassesses the relationship between war and innovation and the role that Imperial has played



20



### 24 Behind the scenes

#### LIQUID ASSET

Civil engineers simulate the ocean in a wave basin

### 26 Going public

#### OPEN AIR LABS

Nearly half a million citizen scientists sign up to help monitor urban and rural environments

### 28 Travel

#### INTO AFRICA

Beate Kampmann's open lab straddles nearly 3,000 miles from London to the Gambia

### 29 Alter ego

#### LIGHT FANTASTIC

Theoretical physicist Martin McCall puts in some out-of-hours fancy footwork on the dance floor

### 30 Good reception

Staff, friends, supporters and alumni get social at recent College events

### 31 Obituaries

### 32 In memoriam

### 34 Alumni noticeboard

### 35 Calendar

#### ON THE COVER

Illustration by Post Typography

## IMPERIAL

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Imperial College  
London



# FROM THE RECTOR

We've taken a long, hard look at our existing alumni magazine and have overhauled its content and design.

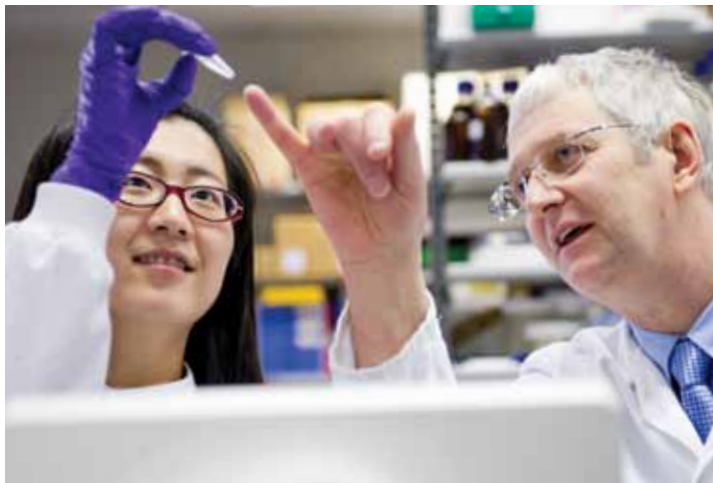


*Imperial's* readers already all have something in common: we are members of an extended family. Whether you are an alumnus, parent, supporter or just count yourself as an interested friend, I hope you will find *Imperial* a good quality read and that it will strengthen the links between us. Your letters and comments are very welcome.

## DOMESTIC AFFAIRS

During my first twelve months as Rector significant changes to the UK's higher education system came into view. We are without question moving into a new world. Public expenditure on research is relatively unchanged for an institution of Imperial's **global quality**, but from 2012 there will be a big shift in the balance of funding for undergraduates. Direct government support will largely end and UK and EU students will instead pay for their university tuition (£9,000 per year at Imperial) through a loan that they will pay back when they are earning enough to do so.

In response we have created a **financial aid** package that will support our twin objectives of maintaining the quality



of our education (which for our science, engineering and medical subjects is expensive) and giving all who can benefit from our courses the opportunity of an Imperial education.

A clear implication of these changes is the need for Imperial to have greater independent and sustainable sources of financial support for students. This year alumni have responded to our appeals as never before – more and more of those who have benefited from **an Imperial education** themselves are assisting future generations of students. For all your donations I am enormously grateful on behalf of the College.

## GLOBAL EFFECTS

This year I have been delighted to meet many proud Imperial alumni and supporters in the UK and across the globe. Alongside the October signing of our agreement with Singapore to develop a **new medical school** we had a wonderfully attended reception, and visits to China and Taiwan at Easter have led to many positive exchanges.

Both visits herald a new approach to keeping College links around the world in good health, and more are planned for later this year (see inside back cover).

A champion for Imperial's international outlook has been our Chairman, the former diplomat Lord Kerr. John retires this summer as Chairman of Court and Council after more than six years of steering through a period of considerable change, not least establishing Imperial as an independent university in its own right in 2007. Fortunately for us, the Deputy Chairman, Baroness Eliza Manningham-Buller, has been appointed to succeed John. We are delighted that a person of such talents is able to follow him.

Wishing you an enjoyable and fulfilling summer.

Best wishes,

SIR KEITH O'NIONS FRS is Rector of Imperial College London. He is a geologist who has worked at Oxford, Cambridge and Columbia Universities, and has served the UK government as Chief Scientific Advisor to the Ministry of Defence, and as former Director-General of the Research Councils.



## INTERNATIONAL LINKS

Sixty Taiwanese alumni gathered for a reception hosted by the Rector in Taipei on 27 April.

# INBOX

As *Imperial* magazine emerges from its makeover and replaces *Imperial Matters*, we reflect on the making of this publication, and invite your thoughts and ideas on future stories.

## A NEW MAGAZINE FOR IMPERIAL

This issue is about exploration of one sort or another. Some articles feature new ways of getting about; others focus on where people have come from, where they are going to, or what they get up to along the way.

Our own exploration has been in charting a new course for this magazine for Imperial's alumni, supporters and friends. We aim to bring you the most interesting and thought-provoking stories and images from this university community, and to feed your brains with the latest discoveries, creativity and thinking coming out of the College. To help us meet this challenge, we have taken a new editorial approach by overhauling design and content, and tapping into the talents of a new group of writers, artists and photographers from all over the world.

A lot of people have kept us travelling hopefully, especially those who said yes to



unusual requests along the way. Thank you to those interviewees whom we tracked down in the Antarctic (page 12) and the Gambia (page 28). Please take a bow all those who endured extreme wind chill to transform Dalby Court into a dance floor one winter weekend (page 29), and everyone who helped with the *Genesis of genius* photoshoot (page 14) when College was closed for the extended Easter break. We would like to raise a special glass to Noah, our Creative Director's newborn, who (almost) managed to time his arrival until after we went to press.

We hope that you will find things that surprise and amuse you amongst these pages, and that you will share your discoveries more widely, whatever your connection with Imperial. In future issues, this page will feature your observations, suggestions and challenges to us, so please get in touch and let us know what you think, or what you would like to see in future issues.

## AT FULL STRETCH

Dance photographer Adrian Weinbrecht shoots from the hip for this issue's article on life outside the office: find out what rocks the world of physicist Martin McCall on page 29.

## CONTRIBUTORS



**NIC FLEMING** is a journalist, rock climber and former street performer. He began his journalism career on the *Daily Express* show business desk. More recently

he was science and medical correspondent at *The Daily Telegraph*. As a keen but not particularly competent climber, he thoroughly enjoyed interviewing explorer Phil Wickens (page 12).

## LEE ELLIOT

**MAJOR** writer of the *Genesis of genius* feature

(page 14) is Director of Research and Policy at the Sutton

Trust, which supports educational opportunities for able young people from non-privileged backgrounds. He was previously an education journalist at *The Guardian* and *THE*. He graduated from the MSc in Science Communication at Imperial in 1994 and holds a PhD in theoretical physics.



**SONIA VAN GILDER COOKE**, an environmental journalist, investigates the power of citizen scientists for *Going public* (page 26). Sonia studied

environmental science at Yale and Oxford before realising that she prefers words to numbers. She is currently extremely content writing for *New Scientist* and online magazine *Slate*.

## TIM RADFORD

former science editor of *The Guardian* and author of geographical memoir *The Address Book*, writes about a new model for international research in

*Travel* (page 28). When he sets off on a trip, he usually packs a Dickens paperback, and tries to remember the advice of the great reporter James Cameron: "Take half the luggage, and twice the money".



**SHARE YOUR THOUGHTS** • by post to Imperial Magazine, Level 2 Faculty Building, South Kensington Campus, London SW7 2AZ • by email to [imperialmagazine@imperial.ac.uk](mailto:imperialmagazine@imperial.ac.uk) • by online comment at [www.imperial.ac.uk/imperialmagazine](http://www.imperial.ac.uk/imperialmagazine) • by Twitter [@imperialcollege](https://twitter.com/imperialcollege) • or in pictures at [www.flickr.com](http://www.flickr.com) using tag **IMP150**





## Catch a falling star

Every six weeks, Dr Phil Bland receives a package of film from farmers in the vast Australian desert. Taken from an array of 'star gazing' cameras set to track meteorite fireballs as they fall to Earth, the film provides clues about where meteorites may have landed. Last December, Phil and colleagues in the Department of Earth Sciences and Engineering travelled to Australia and found their second meteorite in two years. The researchers are now using the images to trace rare information about where it came from in space.

### THE METEORITE,

which is roughly the size of a tennis ball, could reveal vital clues to the origins of the universe.

**50,000+**

Number of documented meteorite falls over the past 200 years

**10**

Number of meteorites traced back to their origins

**100m**

Radius within which the scientists can pinpoint a meteorite's crash site using special cameras

**4.56 billion**

Year record of solar system's formation and evolution



## Five minutes that could save your life

In April 2011, the UK government announced a new five-minute, one-off screening test for bowel cancer, following a clinical trial led by Imperial. The new test, known as Flexi-Scope, could save thousands of lives: about one in 20 people in the UK will develop bowel cancer, with nine in 10 cases occurring in people over 55.

Flexi-Scope is a flexible sigmoidoscope that allows doctors to see and remove small growths on the bowel wall before they turn cancerous.

The trial followed over 170,000 people aged 55–64 for 16 years. Bowel cancer mortality was reduced by 43 per cent in the patients who had the Flexi-Scope test compared with those in the control group.

"No other bowel cancer screening technique has ever been shown to prevent the disease," said Professor Wendy Atkin in the Department of Surgery and Cancer who led the trial.

The research, published in the *Lancet*, was funded by the Medical Research Council, the National Institute for Health Research, and Cancer Research UK.

## A hoodie that hugs +

### SMART CLOTHING FOR PEOPLE WITH AUTISTIC SPECTRUM DISORDERS

A deep pressure vest zipped into a hooded sweatshirt could help people with problems in processing sensory stimuli, such as those with autistic spectrum disorders. Inflating the vest generates an evenly distributed hug-like pressure over the upper body, reducing anxiety in stressful situations and helping some people to calm down and concentrate better.

The clothing will be available from September 2011 and comes from spin-out company Squease Ltd, which won the 2010 Research Councils UK Business Plan Competition. Announcing Squease as the winner, David Willetts, Minister for Universities and Science,

applauded the competition as an excellent way of encouraging researchers to expand their work, consider commercial opportunities and contribute to the UK economy.

Squease was set up by students from the Industrial Design Engineering course jointly run by the Royal College of Art and Imperial. It was supported by the Design London Incubator, launched in 2008 and funded by the National Endowment for Science, Technology and the Arts. The Incubator has supported 11 businesses since it started, of which seven continue to receive support, and four have successfully exited.

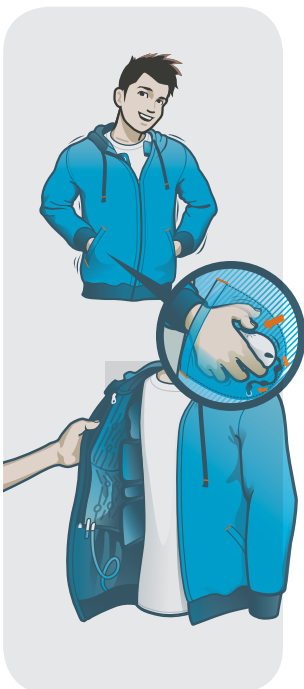


ILLUSTRATION: SHINGO SHIMIZU - PHOTOGRAPHY (METEORITE) TOM WHIPPS

# Pole position

In December 2010, a team of explorers and scientists completed the first there-and-back crossing of Antarctica in wheeled vehicles.



Imperial was the scientific partner to the Moon Regan Trans-Antarctic Expedition team, which travelled across Antarctica via the South Pole in state-of-the-art six-wheel-drive science support vehicles that doubled up as mobile laboratories (above centre and right). The Winston Wong BioInspired Ice Vehicle (above left) was powered by biofuel and named after the expedition's main sponsor, triple alumnus Professor Winston Wong (Physics 1971, MSc 1972, PhD Chemical Engineering and Chemical Technology 1976).

The red radar device in the foreground was used to detect dangerous ice crevasses. The explorers used wireless sensor technology developed at Imperial to monitor in real time how their bodies were responding to the extreme conditions in Antarctica. The technology recorded how the environment and temperatures of around minus 43 degrees Celsius affected their stress levels over their 20-day journey.

Ray Thompson, Senior Research Associate at the Institute of Biomedical

Engineering, was one of the team: "It was amazing to see how my body coped in such extreme conditions, using the wireless sensors. A simple 500-metre walk at the South Pole was the equivalent of me doing 10 laps around an Olympic cycle track at 25 kilometres per hour. The most inspiring part of expedition was the 3,000-metre descent down Leverett Glacier, where clouds of ice surrounded our vehicles, making navigation really difficult. Ten times more people have been into space than to that part of the world."

# TOP/DOCTORS + SCIENTISTS

A healthy dose of Imperial staff and alumni have been ranked top of their fields by *The Times*. Its 2010 Top Doctors Directory selected 16 alumni and many staff as eminent specialists in their fields, and nine were named in the 'Eureka 100' list of the most important contemporary figures in British science. With so much talent to choose from we haven't space to celebrate them all, but here is a small selection.



PHOTO: GEORGE PAGLIERO/MOON REGAN TRANSANTARCTIC EXPEDITION



**DR RICHARD BUDGETT**  
(National Heart and Lung Institute 2001)

For his contribution to sports medicine. Watch out for him at London 2012 Olympics, when he's overseeing all medical and anti-doping services in his capacity as Chief Medical Officer. He won rowing gold at the 1984 Los Angeles Olympics.



**MR BARRY JONES**  
(Charing Cross Hospital Medical School 1974)

For his career as leading consultant plastic and cranio-facial surgeon, with particular expertise in facial surgery on children. He has published numerous papers about facial, breast and cranio-facial surgery.



**PROFESSOR VALERIE LUND**  
(Charing Cross Hospital Medical School 1977)

For her work in ear, nose and throat, including allergy, inflammation, and nose and sinus tumours. She may be the only designated Professor of Rhinology in the UK and was awarded a CBE in 2008.



**DR JOHN SHNEERSON**  
(St Marys Hospital Medical School 1971)

For his work on sleep, including establishing the UK's largest sleep centre at Papworth Hospital in Cambridge, and developing a sleep service for patients with neurological conditions including narcolepsy, sleepwalking and sleep violence.



**PROFESSOR SIMON DONALDSON**  
Department of Mathematics

For his work on the spatial properties of smooth four-dimensional manifolds, which won him the Fields Medal in 1986. He leads an interdisciplinary research team that uses maths to solve scientific problems.



**DR SIMON SINGH**  
(Physics 1987)

For his work as TV producer, journalist, libel law reform campaigner, and author of popular books on science and mathematics. His latest book, *Trick or Treatment? Alternative Medicine on Trial*, is about complementary and alternative medicine.



**PROFESSOR JIM VIRDEE**  
Department of Physics (PhD Physics 1979)

For leading the Compact Muon Solenoid (CMS) experiment at the Large Hadron Collider at CERN in Geneva, where scientists from 38 countries are tackling some of the most fundamental questions of nature.



**PROFESSOR GUANG-ZHONG YANG**  
Department of Computing (PhD Computing 1999)

For his research into medical imaging, sensor technology and robotic surgery, especially in improving accuracy and control. Currently developing ways of doing surgery without making incisions.

## The journey

Terrain	Antarctica
Transport	Winston Wong Bio-Inspired Ice Vehicle and two six-wheeled science support vehicles
Size	10-person team
Distance	4,000 km
Days it took	20 days, 12 hours, 30 minutes
Top speed	65 miles per hour

PHOTOS: (BUDGETT) GE HEALTHCARE, (LUND) ROBERT CLAYTON, (VIRDEE) STFC/IMPERIAL, (YANG) LAYTON THOMPSON





## FIRST CLASS

An Imperial researcher who is developing materials to help the body to repair itself has this year been cited as one of the world's top 100 women in a list compiled by *The Guardian*.

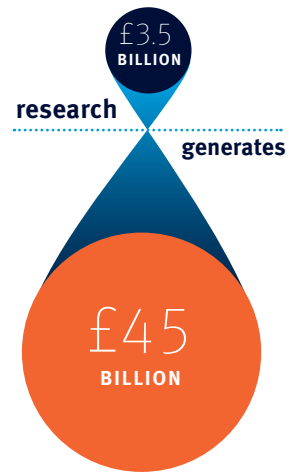
Professor Molly Stevens (Centre for Educational Development 2005), from the Departments of Materials and Bioengineering, appears alongside astrophysicist Jocelyn Bell Burnell, talk show host Oprah Winfrey, and US Secretary of State Hillary Clinton. The list was compiled by an expert panel using more than 3,000 suggestions from *Guardian* readers.

Professor Stevens and her group are working on bone-like materials that could mend patients' bones after they have been in an accident or have had surgery. They are also creating materials to repair tissue, such as heart muscle, which could help patients recover after major heart attacks.

In addition, Professor Stevens has made considerable advances in developing materials for detecting disease-related proteins, which could provide doctors in developing countries with a quick and cost effective way of diagnosing patients for a range of diseases, including cancer and HIV. Professor Stevens said: "I feel extremely honoured that I have been nominated alongside other women around the world who have been such trailblazers in their fields."

## SAVING THE science budget

Research co-authored by Professor Jonathan Haskel from Imperial College Business School is credited with helping to protect the science budget from the big cuts predicted in the government's 2010 spending review.



The work showed that the £3.5 billion a year spent on publicly funded research generates an additional annual output of £45 billion in UK companies – evidence that Minister for Universities and Science David Willetts drew on in discussions with key decision-makers. "It is hard to point to other papers that have had such a linear effect on a government decision," said Professor Haskel. "Imperial is essentially a knowledge factory, and it is therefore fitting that our research investigates how investment in knowledge can serve the economy."

PHOTO: (MOLLY STEVENS) DAVE GUTTRIDGE / THE PHOTOGRAPHIC UNIT



### THE CAT THAT GOT THE CREAM

The London Student Journalism Network crowns Imperial student newspaper *Felix* Publication of the Year, following its stint as a daily, producing **five issues in five days for one week**.



### GAME, SET AND MATCH

Imperial College holds onto its unbroken Varsity record for the **4th year** in a row, with **50 teams** competing in **25 matches**. But at **25-12**, Imperial Medics take home the rugby honours once again.





## Body double



Parts of a car's bodywork could double up as its battery, thanks to a new material being developed by Imperial engineers and scientists and EU partners including Volvo. The material can store and discharge electrical energy, but is also strong and light enough to be used for parts in future hybrid vehicles.



### ▶ GET BRIEFED ON CLIMATE CHANGE

The Grantham Institute of Climate Change is publishing a series of briefing papers by Imperial academics to keep you up to date with recent developments, and to put research in the context of international policy. Topics so far include solar energy for heat and electricity, carbon capture and storage, and road transport technology and mitigation. See <http://bit.ly/mct4BA> for more.

### ▶ JOINT PRACTICE

Imperial has partnered with Singapore's Nanyang Technological University to create the Lee Kong Chian School of Medicine, which will accept its first students in 2013. Professor Martyn Partridge, Senior Vice Dean of the new undergraduate School, said: "The ethos is to produce the sort of doctors that you and I would like to have caring for us."

#### RECORDS SET

1

First in the world to drive the entire length of the Pan-American Highway in an electric car

#### TAILPIPE CARBON EMISSIONS

0

Ran on lithium iron phosphate batteries

#### CONTINENTS

2

#### COUNTRIES

14

## THE CAR IN FRONT IS A SUPERCAR

Last year, a group of Imperial students and alumni completed a 26,000 kilometre journey across the Americas in an all-electric supercar. The Racing Green Endurance team drove their Radical SRZero down the 26,000 kilometres of the Pan-American Highway. They used the journey to show that electric vehicles can have outstanding performance and are a viable low-carbon alternative to combustion engine vehicles.

"At every stop we were surrounded by people from all different backgrounds – from curious businessmen in San Francisco to a 200-strong crowd of onlookers including local farmers at the Guatemala border," said project manager Alexander Schey (Mechanical Engineering 2009). "They were all surprised when we told them that it could run for over 500 kilometres on around \$5 of electricity."



PHOTO: (RACING GREEN) ANDY HADLAND



### PEARLY WHITE TOOTH PALACE

Children are being asked to sidestep the tooth fairy and donate **12,000 baby teeth** for a glittering resin palace to inspire people about the regenerative potential of adult stem cells.



### NEW DIMENSION FOR MATHS

Mathematicians are creating their own version of the periodic table for all possible shapes in **three, four and five dimensions**, by looking for building blocks from around **500 million shapes**.

# ATTENTION TO DETAIL

Recent inventions from Imperial go further than the eye can see. This issue, we focus on four spin-outs that are redefining what high-res means for consumers and businesses.

## 1 / IONSCOPE

Nanoscience comes to life thanks to high-resolution imaging technology from Ionscope. Its scanning systems, based on ion conductance, can view live or soft surfaces in 50 times more detail than a conventional optical microscope. Ionscope Chief Scientist Professor Yuri Korchev, of the Department of Medicine, developed the technology as part of his research to track the tiny detail of biomedical processes, such as how hormones act in kidney cells.

## 2 / MOLECULAR VISION

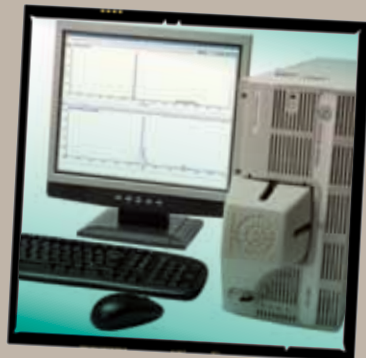
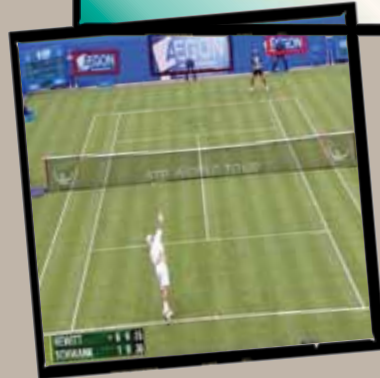
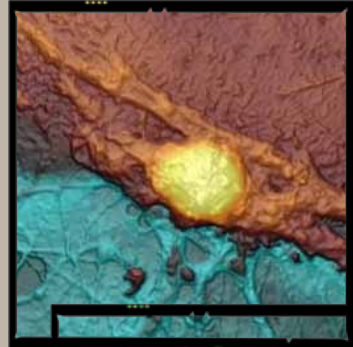
Plastic electronics pioneer Professor Donal Bradley (Physics 1983) of the Department of Physics, co-founded Molecular Vision to develop technology for measuring multiple diagnostic health markers at nano-sensitivities in a single test. The low-cost, point-of-care disposable device based on Bradley's optical detection technology measures previously incompatible markers simultaneously to provide results more quickly. By cutting a series of diagnostic tests down to one, doctor and patient can make better-informed decisions about treatment more rapidly.

## 3 / CORTEXICA

By reverse engineering the way that humans see things, Drs Anil Barath and Jeffrey Ng, Department of Bioengineering, have developed a technology platform through Cortexica Visual Systems for computers to recognise images more intelligently. Modelled on the way that human nerve cells respond to visual stimuli, the technology can be licensed for developing large-scale image searches on TV, video and the internet. An early application is BrandTrak™, which recognises logos across broadcast channels to give businesses a frame by frame analysis of their TV brand exposure. Other potential applications include helping consumers search the web for products using photos taken with their phone, rather than having to type text into a search engine.

## 4 / MICROSAIC SYSTEMS

Analysing chemical samples just got a whole lot more space and energy-efficient thanks to a new generation of mass spectrometers from Microsaic. Co-founder Professor Eric Yeatman (Electrical Engineering 1989), from the Department of Electrical and Electronic Engineering, specialises in the semiconductor processes that have shrunk the essential analysis components so they fit on one chip. Industries such as drug development and food safety testing will benefit from the smaller instruments, which are now the size of a desktop computer.



# On the move

## How is research making it easier to get around London?



**PROFESSOR JOHN POLAK** is Head of the Centre for Transport Studies in the Department of Civil and Environmental Engineering

Managing transport networks and providing travellers with information have traditionally been seen as separate activities. But finding ways to bring them together will help meet new challenges in transport policy, and help people better manage transport systems and personal travel.

One way is to exploit the ever increasing amounts and diversity of data available from GPS, CCTV and number plate recognition technology from London's transport network. One of our current research projects – FREEFLOW – does just this, and has recently been successfully trialled in and around Hyde Park Corner, one of the busiest traffic hotspots in central London.

More data gives us a fuller picture, more accurate predictions, and better ways of using those predictions. When FREEFLOW research reaches a commercial stage, it could help us manage events such as the Olympics, which will place significant new demands on both people and transport systems in London.

**DR DAVID HOWEY** (PhD Electrical and Electronic Engineering 2009) is a Research Associate in the Department of Mechanical Engineering

Road transport is responsible for high levels of carbon dioxide, particulate and other emissions. My research aims to address this by improving the conversion and storage of energy in the powertrain – the systems, such as batteries and motors, that produce and deliver power to move hybrid or electric vehicles.

More efficient vehicles, such as hybrids, are essential if we are to fulfil our commitment to reducing greenhouse gases and comply with the EU Air Quality Framework Directive. The next few years will see a gradual electrification of the powertrain, especially for urban vehicles making short, stop-start journeys.

Reducing emissions sometimes comes at the expense of a more energy-intensive production process, so we need to find the best balance. My hope is that we can also make things less confusing for people looking to buy new vehicles, so that the current industry investment in this area can be matched by consumer confidence in the technology and affordable pricing.



ILLUSTRATION: CHRISTIAN LINDEMANN



**PROFESSOR STEPHEN GLAISTER** is Professor Emeritus of Transport and Infrastructure, Centre for Transport Studies, and Director of the RAC Foundation.

One of the biggest transport issues for London is to find a way of providing for the predicted increase in population, which is expected to lead to an increase in daily trips from 24 to 27 million in the next 20 years. I research the economics of transport, especially the costs and benefits of urban public transport systems, and the benchmarking of transport systems across the world.

By international standards, public transport in London measures up well: we are making improvements to existing infrastructure, such as the Tube; and new projects, such as Crossrail for new rail connections across London, are also progressing.

It is the roads that require urgent attention, as private vehicles are used more than public transport for personal travel in London.

Priorities include ways of improving operational efficiency, handling increased congestion, and making environmental improvements and increasing funding. We need to make more impact than existing user charging and cycling initiatives currently achieve.

**DR RALPH CLAGUE** (Physics 1995, MSc 1996, PhD 2008) is Power Systems Manager at Gordon Murray Design and an Honorary Research Fellow at Imperial

Sustainable vehicle design is moving from being an academic problem to becoming an issue for engineering. I am lucky enough to work with a foot in each camp.

My current preoccupation is to find a way of doing something radically different with personal transport in cities.

How can we engineer and design private vehicles to incorporate the latest technologies, maintain safety, and cut production and running costs? We are looking to new technologies to develop a lighter city car that gives off lower emissions. The design will make it efficient for the school run and the weekly shop, as well as an occasional trip to the airport.

These new priorities are also important for the next generation of design engineers. Imperial students will always love the concept of fast vehicles. But these days they are less inspired by petrol engines, and more interested in finding ways of matching speed with sustainability.





**OCCUPATION:**

Freelance photographer, explorer, expedition guide and lecturer

**LOCATION:**

Peak District, UK

**FIRST JOB:**

Researching biocides for building timber

**BEST JOB:**

Field assistant with the British Antarctic Survey

**GREATEST**

**CHALLENGE:**  
Completing PhD



As a rewarding way to earn a living, **Phil Wickens'** (Biology 1991, PhD 1997) combination of photographing stunning wildlife and landscapes, leading expeditions up unclimbed summits and lecturing on polar biology, geology and exploration history is pretty hard to beat.

BY NIC FLEMING

**+ How did your last expedition go?**

In November I led an Alpine Club expedition to a peninsula east of the Lemaire Channel, in Antarctica. We climbed six previously unclimbed mountains, including one called Mount Matin, which turned out to be 1,000 metres higher than it was on the map, because the explorer Jean-Baptiste Charcot compiled the original maps in 1908 using sightings made from the sea, from where only a shoulder, rather than the summit, was visible.

**+ What do you like to photograph?**

I enjoy wildlife and landscape photography but I'm a bit shy when it comes to photographing people.

**+ How did you get into climbing and exploring?**

It really started when I joined the Outdoor Club at Imperial. At one point everyone was saying they were going to organise an expedition but they didn't, so I ended up organising one to the Pamirs, in Tajikistan, in 1992. We climbed five mountains with some new routes and first British ascents, and collected specimens for the Natural History Museum.

**+ Did your expeditions get in the way of your studies?**

No, quite the opposite. For my PhD project I was developing a method of preventing decay in building timbers. The people I was climbing with studied in a wide range of disciplines, and while on trips they would suggest different people to speak to. I ended up getting fantastic help from the Departments of Chemistry, Chemical Engineering and Chemical Technology, Civil Engineering and Mathematics, at a time when there was not much multidisciplinary research going on.

# >> frozen moments



**+ Why does Antarctica keep drawing you back?**

Once it bites you, it doesn't let go. It is incredibly beautiful, harsh and unspoilt. It's amazing to see how life has adapted to living on the extremes, and wonderful to be in a place where none of the wildlife has any fear of you. To them you are just like another penguin walking past.

**+ Are you particularly attracted to unclimbed peaks?**

Yes, there's something attractive about going where no human has ever set foot before. It's just like the feeling that draws you up to mountain passes to see what is on the other side, only on a larger scale. It's certainly not about the fame, fortune and riches. Or if it is, I haven't yet worked out how to get those yet!

**+ What's your top careers tip?**

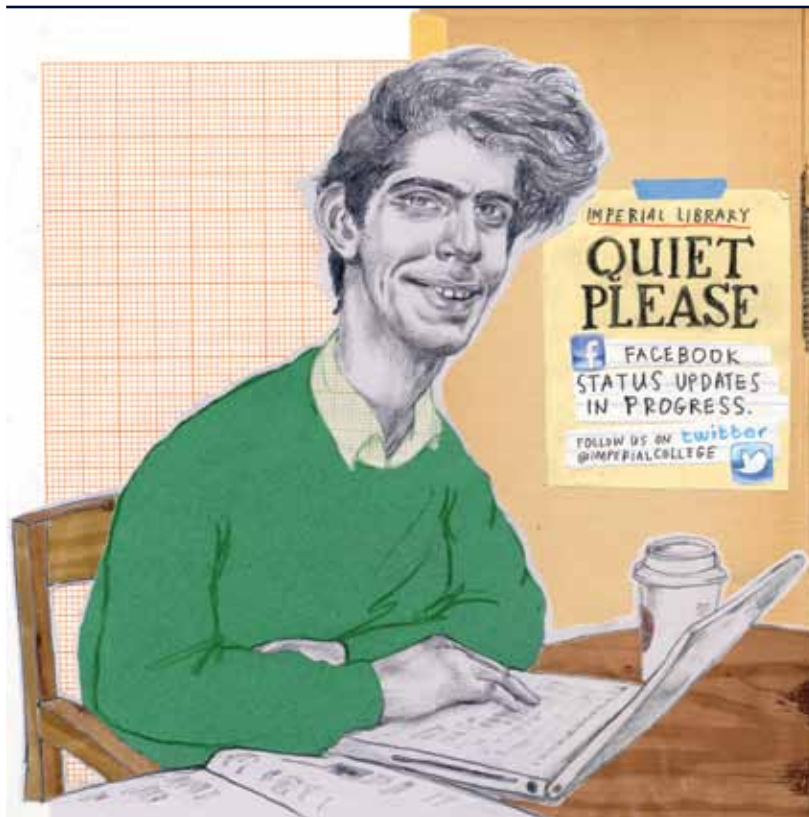
Those I work alongside all have a passion for what they do and the places they go. If you would happily do something without being paid, then that's the right job for you.

❶ Phil enjoying a rare moment of good weather off the southern-most point of South Georgia. // ❷ A chinstrap penguin wading through a melt pool from its nesting site at Baily Head, Deception Island. // ❸ Negotiating heavy brash ice on the Antarctic Peninsula. Phil's picture was taken from the top of Spirit of Sydney's mast. // ❹ Mike Fletcher (also an Imperial alumnus) starting up the crux ice slope during the first ascent of Mount Cloos (1200m), Antarctic Peninsula.

PHOTO: (PHIL) ZAKBASSON, (ALL OTHER IMAGES) PHIL WICKENS

# social science

Students can't get by today without a life online, says Kadhim Shubber



▶ It's hot. Uncomfortably hot. Unbearably hot. *Library* hot. The bright sunshine that those fortunate souls out there are enjoying on the Queen's Lawn, not only makes revision all the more difficult but adds insult to injury, by powering the rather unpleasant greenhouse effect in the library.

Rows upon rows of computers only exacerbate the problem. It's a quirk of the twenty-first century that students value the Central Library more for its computers than its books. (Empty desks are also appreciated; plenty of elbow room to use our laptops, smartphones and iPads). But this is inevitable. Computers, and in particular the social networks that we access through them, are an indispensable part of university life.

Perhaps the biggest story so far this year, an event that brought students out to protest in December, was the restructure of the Department of Life Sciences announced last summer, which led to 14 redundancies. Leaving aside the arguments for or against the restructure, it demonstrated the impor-

tance of online social networks in modern protest. Over 1,000 students (and some of their lecturers) discussed the changes in a protest group on Facebook and through events they rallied hundreds to show their discontent. By contrast, neither the proposed hike in tuition fees, nor the cuts to higher education funding, elicited much more than a shrug from the student body at Imperial – whether this shows acumen or apathy is debatable. I suspect that the former is true; Imperial College Union was one of only two student unions, of which I know, to publicly support the Browne Review.

A more sombre use of social networks like Facebook emerged after the disappearance of Anthony Soh, a first year Mechanical

Engineering student in March. Social media drove efforts to find him. Thousands of people came together in a group dedicated to raising awareness about him; when it comes to getting attention, with over 26 million Facebook users in the UK today, posters on Facebook are just as important as posters on streets. When the sad news of his death emerged, the memorial page on Facebook became a place for people to recount their memories of him and express their grief. May he rest in peace.

On the other hand, the limitations of the online world are as obvious at Imperial as its successes. An online marketplace, called iConnect and created by a group of entrepreneurial students, has yet to threaten the poster boards on the Walkway as the place of choice to advertise for new flatmates. Candidates running recently for positions in the Students' Union created Facebook groups, but they all learnt that it's face-time on the ground that actually wins votes. Though Facebook helps us to remember the names of all the people that we meet in Freshers' Week, it's in the physical world that we truly make and maintain our friendships. Despite this, however, Facebook (and to a lesser extent, Twitter) has become a forum for Imperial's community to coalesce. We live parallel lives; a physical one and a digital one. After the Varsity rugby match between the Medics and the College, the banter continued online when Felix uploaded photos of the match. As Imperial's Racing Green Endurance team drove from Alaska to Argentina in an electric sports car, we followed their adventures on Twitter. When I want to have a party, or organise drinks with my friends, I create an event on Facebook.

Ultimately, if you can't get online, then you can't fully participate in Imperial's community. For that reason the demand for computers in the library is unlikely to abate. In response, the library has launched a new feature at the entrance that lets you know where you can find a free computer. Unfortunately it doesn't solve the perennial problem of finding that your 'free' computer has been claimed by an elusive character who has marked their territory with a bag and some books – the limitations of technology strike again.

KADHIM SHUBBER is Editor of *Felix*, the Imperial College London student newspaper. He is on sabbatical from his Physics degree for a year.









# genesis of genius

BY LEE ELLIOT MAJOR

PORTRAITS BY  
TRICIA MALLEY AND  
ROSS GILLESPIE

As Imperial launches a campaign to sustain scholarships and financial aid for future students, *Imperial* magazine catches up with an alumnus, who is using his own experiences to guide boys from under-represented backgrounds into higher education.

By pure chance I meet Dr David Pollard (Physics 1978, PhD 1983) a few days after the Prime Minister has done him a huge favour. The news pages and airwaves are still busy covering David Cameron's criticism of Oxford University's 'disgraceful' under-representation of black pupils among its undergraduate ranks. What has catapulted this story up the news agenda is not the alarming fact that only one Afro-Caribbean student made it into Oxford in the 2009–10 academic year. No, the press have pounced on Cameron's wider and inaccurate claim that there was a solitary 'black' student admitted last year. Oxford was quick to issue a potentially embarrassing rebuttal to its former student: in fact, 27 British students of its 3,000 new undergraduates were self-declared as black last academic year. (The equivalent figure from Imperial is 42 out of 2,574.)

The episode says as much about the preoccupations of the white-centric Oxbridge educated elite of the British press as it does about the accuracy of the PM's briefing notes. But for David (pictured left on a return visit to Imperial) the high profile mistake has been an unexpected publicity boon. No amount of campaigning could have highlighted so succinctly one of the toughest educational challenges facing the country: the tragic waste of academic talent among black Afro-Caribbean boys.

"I would have preferred it if he had got his facts right, but it is very good of him to raise the issue," says David. "As it turns out, the mistake has made people more aware of the big differences between black students of Caribbean rather than African extraction."

David's passion is ensuring that bright black boys – many from broken homes on inner-city estates – fulfil their academic, specifically scientific, promise and gain entry to the country's elite universities.

Some say it is a scandal that still only around half of all pupils at age 16 in England leave school with the very basic attainment measures – gaining at least five C grades and above in their GCSEs including English and maths. Among black Caribbean boys, only just over a third – 37 per cent – passed this minimum threshold in 2009–10.

David is ideally qualified to speak on the subject. As a young man from Guyana, he was one of two or three black students among the sea of white faces in the undergraduate physics lecture theatre at Imperial College in 1975. With a PhD, also earned at Imperial, and a high-flying career behind him, he is now active at Imperial again.

David is chairman of Generating Genius, a university access scheme with a specific aim: to turn talented black boys, particularly those with Caribbean heritage, into scientists and engineers.

It all started at a school reunion, when David got chatting to Dr Tony Sewell, chief executive of Generating Genius, and found a kindred spirit. Here was someone who shared his concerns and was doing something about it. The two, perhaps unwittingly, have become role models for a special group of protégés.

In 2006, 25 boys aged 12–13 spent three weeks during the holidays on a summer school at Imperial, engaged in ‘hands-on’ science with some of the College’s leading academics. Every year since, most of the group has returned for more. These are no ordinary out-of-school lessons: in one project, the boys present their plans for combating malaria; in another they apply their new-found knowledge of cutting edge robotics. At the end of the summer school, the students present their work to a panel of experts.

The work of the charity is underpinned by two fundamental insights. The first is that it is not colour or creed, but culture and class that drive low aspirations and achievement among the boys. The second is that their educational decline needs to be halted during early secondary school, before the boys have reached their teenage years, and when a place at an elite university like Imperial or Oxford is yet a distant dream.

Writing in *The Daily Telegraph* in the aftermath of Cameron’s comments, Tony sums up the challenge: “The real issue is that this group, whose grandparents came here in the 1950s, have simply integrated into the wider poor working class, and fallen victim to exactly the same problems.”

“Caribbean children are more likely than any other to come from a seriously disruptive family background – whereas their African cousins, blessed with stable families and the new arrival’s determination to build a better life, are shooting up the educational rankings. Just like the white working class, the Caribbean community has become mired in a culture of dependency, where you can still be rewarded for doing nothing.”

This appears to be a distinct phenomenon in Britain: the white working classes and Caribbean cultures have melded into one to create a new anti-educational sub-culture. Two groups of children have become conspicuous for being bottom of class in inner city schools across the country: white working class and Caribbean boys. The much debated black-white gap in the United States has less meaning on the UK side of the Atlantic.

The impact of different family cultures came into sharp focus, David says, when Eton College, the famous independent school near Windsor, approached the charity with a potentially life-transforming proposition. “We had a generous offer from Eton for some of our boys, or others whom we could nominate, to try for a scholarship to study at sixth form there from autumn 2010,” he says. “But we could get very few Afro-Caribbean families to go for that. They just weren’t keen at all on sending their children to what they saw as some posh place in the country. What we found was that the children getting put forward were, to a man, black African. The Africans didn’t have a problem at all, but black Caribbeans just didn’t want to know.”

It is little wonder that Afro-Caribbeans make up such a tiny minority of the few places won by black students at Oxford or Imperial. As universities are at great pains to explain, their admission figures are largely the product of earlier educational gaps that emerge before and during school. For black Afro-Caribbean boys, results during primary school are quite good, says



“David’s passion is ensuring that bright black boys fulfil their academic promise and gain entry to elite universities.”

David, “but it all goes to pot by the time they do their GCSEs at age 16”.

David believes the downward spiral of academic results during the teenage years is partly due to the dysfunctional home lives that many boys lead but also, he asserts, “the whole view of the system towards them changes”. This includes, he argues, many teachers, who are fearful of the young men in their classroom. “It creates the wrong environment for someone to shine academically,” says David. “The kids are very able, but their lives can be difficult and chaotic. You realise that if you don’t help them, if you don’t keep carrying the ball now, it will be dropped, and it will be difficult to get it back.”

All this is a far cry from the aspirational upbringing enjoyed by David during the 1970s in the small Caribbean country of Guyana on the northernmost tip of South America. “The (grammar) school always had high expectations of what I would become and what I was doing,” he says.

One role model at the school was head boy, Trevor Phillips (Chemistry 1975), now head of the UK’s national equalities body. David’s father was a leading academic at the University of Guyana, establishing a social work degree course; his mother was also a social worker. It is fair to assume that they played a large part in instilling the

*“When they see a black kid...they are not thinking here might be a next Stephen Hawking or Roger Penrose. That has got to change.”*



academic fervour and social conscience that characterises their son and David still retains a keen interest in the politics of Guyana.

David travelled to London to study physics at Imperial in 1975, taking a first class degree. Then at Cambridge, he gained the notoriously tough Master's degree – the Mathematical Tripos Part 3 in applied maths and theoretical physics and got engaged to his wife Annabelle (now a consultant gynaecologist). He then returned to Imperial to do a PhD in theoretical physics. It was as theoretical as it gets: estimating the cosmological constant, the number that tells us when the universe will stop expanding.

After a stint at the University of Guyana, he returned to the UK. David became a senior physicist at BP – applying science to develop large oil and gas production projects. Then a headhunter from the City came knocking in search of physicists like David, who could apply their differential equations to predict trends in the financial markets instead. At the Citigroup bank David was, until 2007, a director developing strategies and valuation tools for high frequency bond trading. He now continues on a freelance basis.

“It turns out that the equation that governs how you price an option is the same equation that governs heat conduction in pipes,” says David. “The diffusion of information on stock prices is not that different from the kinetic diffusion in molecules.” What he finds most satisfying about the job is the immediacy of the feedback. In his academic work on the cosmological constant, “you could live and die and not know whether you were wrong or right”, he explains, whereas in finance, “you know by the end of the day when you see the profit and loss statement”.

A generation on from his studies at Imperial, David remains the exception for male Caribbeans in Britain. For the Pollard family, this came to light when David's daughter, Arésé (Biological Sciences 2005, MSc Business School 2006), won a place to study biology at Imperial in 2002. The make-up of the lecture theatres had changed a lot in three decades – with ethnic minorities now a significant presence. But it was predominantly young Asians who had broken into the elite university ranks. And it was mostly females making up the small contingent of black Caribbeans. Universities have seen a huge expansion of student numbers since

the 1980s; yet black Caribbean boys remain the educational outcasts.

In frugal times, the challenge for Generating Genius is now to raise more funds and scale up. The charity wants to recruit more cohorts of black students and offer activities during holidays throughout the school year. One idea has been to start Saturday classes. But funds have been hard to find. “We are not touching as many as we could do,” says David.


But now the charity is armed with actual results. Seventeen of the original 25 boys lasted the five-year programme, between 2005 and 2010. All have received offers to study at an elite university (including five from Oxford, Cambridge and Imperial), and 90 per cent are predicted to get A or A\* grades in their science A-levels this summer.

While it is difficult to discern the exact impact the programme is having, these are impressive outcomes for a group where 90 per cent are from single parent backgrounds, and 95 per cent will be the first in their family to go to university.

These 17 are the few bucking the national trend. But David argues that the importance of this agenda goes beyond the small numbers involved: “In terms of Britain's reputation for fairness and opportunity, I think it is an important thing.”

So, how soon does David think it will be before Britain has its own Obama moment – the first black PM? “We will more likely find someone of Asian background before a black person has a chance,” he says. “I would have thought that would be a generation away at least.”

And what would he say, if asked for advice on this issue by the current Prime Minister? David says: “I don't think there is one silver bullet that will work. We need to find the people involved with other organisations like Generating Genius – those who are getting somewhere with this thing – and support them until there is enough momentum for a national policy to emerge.”

He does however believe that there is a lot still to do at universities today. “When they see a black kid there, they are not thinking here might be a next Stephen Hawking or Roger Penrose. That has got to change.” He has a dream of course – that one day such a genius may be generated at Imperial. 

#### CREATING OPPORTUNITY

Far left: Generating genius Chief Executive Tony Sewell (l) and Chairman David Pollard aim to turn talented black boys, particularly those with Caribbean heritage, into scientists and engineers.



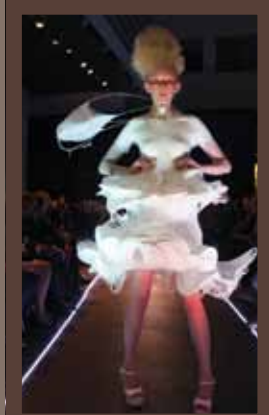


# spray-on science



Silly string sprayed by party goers was the inspiration for this à la mode collaboration between chemical engineer Professor Paul Luckham and Spanish designer Dr Manel Torres (top l-r). The duo met in 1998 when Manel was at the Royal College of Art, working on ways of making fashion more futuristic.

Over the years, they experimented with mixtures of fibres, polymers and solvents, so that their liquids would turn into fabric when sprayed onto a surface. They explored particle and aerosol technologies, and learnt how to balance one-off artistic creations with reproducible scientific results.



They set up Fabrican Ltd to commercialise their products: the technology for spraying liquids using pressurised spray guns or aerosol cans; materials of different strengths, colours and softness; fabrics that stick strongly to surfaces and those that can be peeled away. Their breakthrough came when they sprayed a T-shirt that could be taken off and put on again.

For London Fashion Week in autumn 2010, Manel transformed Imperial's Main Entrance into a catwalk. He designed a spray-on Spring Collection of white dresses that was the talk of the town and captured the imagination of journalists from around the world. Healthcare, design and transport companies have since been in contact about other uses for the technology.

PHOTOS: LEONARDO DOMINGUEZ TEIXEIRA, JAN GILLET, JODY KINGZETT, CAROLINE PREW, SLOBODAN PADOŠAVJEVIĆ, LAYTON THOMPSON





TECHNOLOGIES

OF WAR AND PEACE



By putting scientific experts and technological development at the heart of the Second World War, a new history by **David Edgerton** reassesses the relationship between war and innovation.

When I speak with scientists and engineers about the role of the British in the Second World War, conversation often turns to the general effect of war on science and technology. I am told that war has been a great stimulant to science and to the development of inventions. This has long been the view of many scientists, engineers and even historians. They might use a classic example such as penicillin. Discovered in the 1920s in St Mary's Hospital, it was shown to have extraordinary anti-bacterial properties in humans at the beginning of the Second World War. By the end of the war it was produced in large quantities, and went on to transform peacetime medicine with remarkable speed. Yet, there have also been authoritative dissenting views about the relationship between war and innovation.

Perhaps the most surprising dissenter was Sir Henry Tizard, Rector of Imperial from 1929 until 1942. He was also, in effect, chief scientific advisor to the Air Ministry and Ministry of Aircraft Production until 1943. Since the 1930s he had been at the forefront of supporting the development of radar (most famously), as well as jet engines, atomic weapons and operational research. Speaking in 1948, when he was the equivalent of chief scientific advisor to the Ministry of Defence, he said: "It is a mistake to suppose that science advances rapidly in a war. Certain branches of science may receive a special stimulus, but on the whole the advance of knowledge is slowed".

The great railway engineer Sir William Stanier had been a member

of the wartime Engineering Advisory Council that advised the War Cabinet. He was also scientific advisor to the Ministry of Production, and noted in the 1956 special centenary number of *The Engineer*:

"Though war stimulates advances it does so only in restricted fields. In other fields advance is brought almost to a halt not merely 'for the duration' but for long afterwards. ...during the war, the thoughts of many brilliant men had to be turned away from the creation of things beneficial to the human race and concentrated upon devising new means of destruction or new means of averting an enemy's destructive intentions..."

Stanier believed that the influence of war upon engineering advancement was to retard rather than to further it, and that the benefit was "more than over-balanced by the setbacks suffered in other fields and the wastage of talent inherent in the design of destructive instead of constructive things".

The conventional argument with which they disagreed was that war forces government to invest more in research and development in general, and that this leads to the development of sciences and technologies for civilian and military use. Hidden within such arguments are powerful and influential assumptions about the relations between science, technology and war. These suggest that modern war relies on great inventions derived from civilian research. Such was the story told for aircraft, radio, new explosives and propellants and, of course, atom bombs. Science and technology were inherently civilian; their power was shown by the application to war. In this view, the military were cast

ILLUSTRATIONS BY  
MARK ALLEN MILLER

as technologically conservative, resistant to the new machines offered by civilian ingenuity. Those who held this view, often also believed that these technologies would bring about a world of perpetual peace, if only human organisation were modernised, in the form of a world state.

Such assumptions may help explain a curious implicit distinction made between different kinds of machines used by armed forces. Compare, for example, London's Science Museum with its Imperial War Museum, both of which are full of machines. In the Science Museum we find military aero-engines, military aircraft, early rockets (including V2s, illustrated below), radar and the story of atomic bombs, but none of the tanks, guns, or bombs that reside in the Imperial War Museum.

The distinction here is that, while aeroplanes, aero-engines, electronics and atomic physics are essentially civilian and have proved their worth by their centrality to war, 'pure weapons' lie outside the realm of science and technology. But does this distinction make sense? Would it not be better to think of separate but overlapping realms of military and civil machines, both subject to research and rapid advance? This is, in effect, what Tizard and Stanier thought, and I believe that the answer is an obvious 'yes.' Less obvious, perhaps, is that machines and techniques, such as aviation, radio and radar, routinely labelled as civilian innovations that have transformed war, should be seen as primarily military.

Aviation and aero-engines were overwhelmingly a military concern, even in peacetime before and after the Second World War (some 75 per cent by value was military). The connections between radio and the military had been intimate from the earliest days, when the Navy was the major customer for radio. Radio remained closely allied to the state through the inter-war years. Radar was the product of military research establishments. The atomic bomb was more clearly distant from the military, but soon became an essentially military project.

Perhaps the Science Museum should consider removing its primarily military technologies, like aeroplanes, aero-engines, early radio, many early computers, and most of the nuclear field, and donate them to the Imperial War Museum? Or better, maybe it should display a wider range of weapons that were as much the product of science and technology, as the civilian technologies it focuses on. For the military used science and technology, not only to develop the aeroplane, radio or atom bomb, but also guns, explosives and poison gas. We might also consider why the V2 rocket is prominently displayed in both the Science and War Museums pointing upwards, rather than downwards in the direction in which most Londoners would have experienced it, as a

former curator once memorably pointed out to me.

In assessing the role of war in driving the progress of science and technology, we also need to recognise the significance of the military and military institutions for science and technology. It is greater than we might imagine.

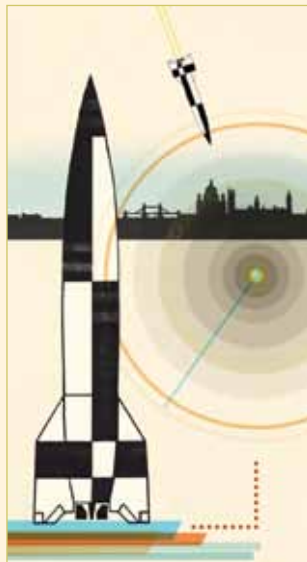
Take, for example, the history of Imperial College London. More than half of its 15 Rectors have had significant and long-standing connections to the military. Sir Alfred Keogh, the first long-serving rector (1910–22), was a medical man, and creator and great organiser of the Royal Army Medical Corps. Successive Rectors from 1929 to 1954 – Sir Henry Tizard, Sir Richard Southwell and Air Chief Marshall Sir Roderic Hill – came from the military aeronautical world. From the late 1960s through to the 1980s, two nuclear knights, both later nuclear peers,

presided: William Penney (Mathematics and Mechanics 1929, PhD 1930), Rector from 1967–73, led the team that built the first British atomic bombs; Brian Flowers, Rector from 1973–85, played a leading role in developing atomic energy in postwar Britain. More recently, three Rectors have worked as chief scientific advisor to the Ministry of Defence: Lord Oxburgh, Sir Roy Anderson (Botany and Plant Technology 1968, PhD 1971) and Sir Keith O'Nions. Together with Cambridge, Imperial also provided the core of scientific civil servants who rose to senior positions – men like A.P. Rowe (Physics 1920, DIC 1924), who headed the main radar laboratory during the war, and Harold Roxbee-Cox (Aeronautics 1923, DIC 1926), who supervised the jet engine programme.

The world of weapons development stretched beyond government laboratories and programmes.

It involved not just academic research scientists, but also industrial researchers, inventors, military officers and, indeed, politicians. The idea that the British political and military elite have been technologically conservative is wrong. For example, in the Second World War, Britain saw an extraordinary cult of invention, and its high priest was Winston Churchill. The myths that have accumulated around Barnes Wallis (inventor of the bouncing bomb and a Civil Engineering researcher in 1937–38) and, to some extent, Frank Whittle (co-inventor of the turbojet engine) are just that. The reality was very different.

Winston Churchill not only personally supported all sorts of inventions, and kept unorthodox inventive organisations going, but invented an extraordinary machine himself. In November 1939, he came up with an idea, a sketch, for a gigantic earth-moving mole that would cut huge trenches. His idea was that 200–300 of these 100-ton monsters would be used along a front of 20–25 miles, moving through the night from one front line to the other. Churchill wanted a means of "breaking a dead-



lock on the French front without repetition of the slaughter of the previous war". They were to be powered by a Rolls-Royce Merlin aero-engine, precious things in early 1940, which even Churchill could not prise out of the hands of the Air Ministry, despite his furious efforts. With the fall of France, the machine was essentially redundant, and Churchill, now in Downing Street, reduced the order to 33 machines, and then to four, which did get built.

It is tempting to look at Churchill's mole and to assume, since no-one else made one and none was needed, that the whole effort was thoroughly misplaced. Yet, in a different scenario, the mole could have become a famous and decisive weapon, one which might have led, say, to an Anglo-French march on Berlin in 1941.

There were other inventors in Parliament. William Helmore, MP for Watford, invented a giant air-launched and radio-guided torpedo powered by aero-engine, which was developed at the end of the war. A former MP, Sir Dennistoun Burney, worked on a gliding torpedo, the Toraplane. He also invented a recoilless gun (he had invented the mine-sweeping paravane in the Great War, and was later to pioneer the freezer-trawler).

Military inventors included Major General Sir (as he became) Millis Jefferys, who ran an outfit called 'Winston Churchill's Toyshop', which was responsible for all sorts of gadgets, and Lieutenant Colonel Stewart Blacker, inventor of the Blacker Bombard and the Petard, and important contributor to the Hedgehog anti-submarine device and the PIAT anti-tank gun. Or take the reclusive genius Geoffrey Pyke, inventor of the iceberg aircraft carrier, or the lawyer Edward Terrell (son of Terrell of *Terrell on Patents*), inventor of plastic armour.

So much invention was going on that, for some senior scientists, it was causing problems. A particularly vocal opponent of over-invention, and indeed of Churchill, was the only scientific Nobel laureate ever to sit in Parliament. In 1940, A.V. Hill was elected by the graduates of the University of Cambridge to one of their two parliamentary seats as an independent conservative. He complained to parliament in February 1942: "There have been far too many ill-considered inventions, devices, and ideas put across, by persons with influence in high places, against the best technical advice... They have cost the country vast sums of money and a corresponding effort in development and production, to the detriment of profitable expenditure of labour and materials elsewhere." We know from Hill's papers that he thought the greatest waste of money was the anti-aircraft rocket programme, strongly backed by Churchill, which he described as a "most infernal waste of time, effort, manpower and material".

Another example is physicist Patrick Blackett, then at Manchester but later to become a key figure at Imperial. Blackett engaged in a general critique of the pursuit of novelty, criticising the call for 'new weapons for old' as a form of "escapism". Too little effort was going into "the proper use of what we have got", he wrote. Changing tactics could be more effective than changing weapons. He wanted to redeploy scientists from research and devel-

opment to "improve the operational efficiency of equipment and methods now in use".

These were also very much the views of Sir Henry Tizard, another key figure in promoting operational research. With Blackett, he opposed the British atom bomb programme on the grounds that it was likely to take longer and cost more than promised. They were proved correct, with no bomb being made until the US one in 1945. Far from being cheaper than conventional explosive, it was the most expensive explosive device ever made: the US bomb took at least two years longer, and cost 50 times more, than the British bomb was meant to. Here, it is scientists who seem to be the technological conservatives.

The war inevitably also saw wasted invention. Yet the extent to which some of these wasteful inventions became known as important contributors to victory is surprising. The atomic bomb is the most famous new device of the war, but its contribution to fighting the war was negative. It marked, rather than brought about, the end of conflict. British jet engines made no impact. Although the two artificial Mulberry harbours towed to the Normandy beaches were much celebrated, they contributed less

than propaganda implies, then and since. The PLUTO (Pipe Line Under the Ocean) was designed to take petrol across the English Channel. Built at great expense, it turned out to be quite unnecessary and worked very badly. The impact of the bouncing bomb was exaggerated: it led to severe losses, ensuring that Bomber Command never used it again. Of the famous developments only radar and penicillin made definite positive contributions, to which can be added the more recently known code-breaking methods and machines.

What then is the verdict? Does war accelerate or decelerate the progress of science and technology in general? My view is that, on balance, Tizard and Stanier were right: the development of key civil technologies has probably been retarded by war. On the other hand, we should not neglect the significance of the military and military-related institutions that have been remarkably productive of military technologies (contrary to cliché), some of which are mistakenly characterised as civilian technologies applied to war.

The proper answer is that we cannot really be certain. As with so many debates about science and technology, this one must proceed by assertion and anecdote rather than carefully analysed evidence. It does so, not at random, but within a framework of assumptions that we would do well to be aware of, and against a backing track of quiet dissenting voices, not least from Imperial, which provide a little grist to the mill of critical analysis. ■

DAVID EDGERTON (*PhD Social and Economic Studies* 1984) is the Hans Rausing Professor at Imperial's Centre for the History of Science, Technology and Medicine. His latest book, *Britain's War Machine: Weapons, Resources and Experts in the Second World War*, is published by Allen Lane.

"It is a mistake to suppose that science advances rapidly in a war."

Sir Henry Tizard, Rector, 1929–42







# LIQUID ASSET

BUILT IN 2003, IMPERIAL'S WAVE BASIN PROVIDES RESEARCHERS WITH 360,000 LITRES OF WATER TO EXPLORE HOW WAVES BEHAVE



**02 MARINE RENEWABLE ENERGY** Dr Johannes Spinneken (PhD Civil and Environmental Engineering 2009) on the left, is looking for ways to harness wave energy, which could meet up to a quarter of the UK's current electricity demand. His research challenge: how to translate the large but relatively slow forces of waves into the smaller, faster forces that drive electricity generators? The answer may lie in snake-like energy converters that float on the water surface and absorb energy along the crest of the wave as it passes.



**01 OFFSHORE ENGINEERING** How offshore structures interact with waves is of keen interest to the oil and gas industry. The basin is in Skempton Building and is equipped with pressure transducers, laser sensors and video imaging to observe how waves and structures interact. Here, civil engineering students (right) are getting ready to test how waves hit a platform deck from below, using a model jacket structure that will be fixed to the basin floor.



**03 MAKING WAVES** Measuring 20m x 12m with a depth of 1.5m, the basin fills in just one hour with over 1,000 bath tubs of water, recreating ocean events at a scale of 1:100. The still water in this picture reflects the calm before the storm that will be whipped up by programming the numbered red paddles to create waves of specific frequency and direction. The articulated basin floor can be modified to replicate conditions for deep water and shallow coastal engineering.

PHOTO: DAVE GUTTRIDGE/THE PHOTOGRAPHIC UNIT

# Open air labs

A nationwide project is harnessing the curiosity of communities, raising environmental awareness and generating publishable research data at the same time.

BY SONIA VAN GILDER COOKE

**It's a brief that might stump even the most cutting edge research group: to mobilise thousands of ordinary people, and get them to produce publishable scientific data. Yet that's exactly what Imperial's Open Air Laboratories (OPAL) network is doing, by partnering top scientists with the public. In all corners of England, people are taking samples from ponds, counting bees and tracking aeroplane contrails. The fruits of that work will show up in peer-reviewed journals. And luckily, there's a lichenologist who's up to running it all.**

Dr Linda Davies (T.H. Huxley School 2003), who heads up the £13 million Big Lottery-funded OPAL project, has none of the reticence you might expect from a lichen lover. Under her direction, universities from Newcastle to Plymouth have joined with local communities to study topics as diverse as hedgehog ecology and orchard loss. In Birmingham, teams are investigating how bees, birds and bats survive in the big city. In the East Midlands, groups of young people are mapping the region's heaths. "We've trained 40 hedgehog champions in York," Linda says, proudly.

It's an undeniably sprawling, ambitious programme and, so far, it's been a success. To date, 425,000 participants have collected wildlife and habitat data from 11,000 sites around England. OPAL has brought in everyone from school children and asylum seekers to young offenders and pensioners. Project partners include the Natural History Museum and the Met Office.

Once every six months, OPAL channels this enthusiasm by launching a nationwide biological survey. Forty thousand budding field assistants (half of whom are schoolchildren) head out to gather crucial information about English nature. Participants then feed their data – whether it be the number of froghoppers in a hedge or the pH of their local lake – into an online public database. One elderly lichen spotter from Sheffield says counting the little organisms for OPAL's air quality survey gives her a reason to go out. Hundreds of people who previously



couldn't tell a sycamore from an ash now send in regular reports of the species in their woods. Even children's games play a part:

"we're studying

how manmade environments can change wind speed and direction by blowing bubbles," says Linda, referring to an activity in the climate survey that is particularly popular with school kids.

The data's journey from school playground to Imperial's database is just the beginning. From there, researchers analyse and transform it into indicators of environmental change to inform environmental policies. "Common organisms like earthworms are often neglected when it comes to monitoring," says Linda. "We're providing data that simply hasn't been collected before."

OPAL has also swelled the ranks of natural history societies, which will sustain enthusiasm generated by the project. And where there wasn't a group, OPAL created one: the newly minted British Earthworm Society teems with fans of the prosaic creature.

This native fascination with flora and fauna is what spurred Linda's involvement in the first place. While surveying lichens in London for her research, she was often approached by people who wanted to know what she was up to. "Everybody wanted to talk with me," she recounts. "It was amazing but I would think, I've got to survey 200 trees today. I simply cannot afford to stop and chat." Davies concluded there had to be a way to bring busy scientists and curious citizens together, and the seeds of OPAL were planted.

So far, so warm and fuzzy, but can OPAL actually produce quality science? That's where the top-flight scientists come in and carefully translate their research questions into activities for the public, says Linda. "We've put in a lot of work to make sure the data is rigorous by minimising error and uncertainty in our methods and results," she explains. "The

sheer quantity of data also helps us identify clear trends that we can then look at more closely." Results from the soil survey have been encouraging: pH data from the citizen corps closely matches British Geological Survey records.

It's no mystery why so many ordinary people eagerly join in. But what could coax busy scientists to give their time? OPAL awards a series of research grants to scientists, which must be split 50:50, with half going to research and the other half to support public engagement. Research funds may have attracted the scientists' attention, but many have ended up volunteering themselves and their families to spend weekends with the public.

A lot of research simply wouldn't get done without the programme. It was an OPAL grant that enabled Imperial atmospheric scientist Professor Ralf Toumi (Chemistry 1987) to use data from weather monitoring stations in schools across London's 32 boroughs. Ralf's group helps the kids become mini meteorologists, while new data on solar irradiance is whisked automatically to Ralf's lab, helping him to track pollution above London more accurately.

*Hundreds of people who previously couldn't tell a sycamore from an ash now send in regular reports of the species in their woods.*

OPAL-funded research has already made its way into the pages of scientific journals, with more papers to be published during the first phase of the project. Despite OPAL's value to science, however, Linda emphasises that all the research in the world won't solve environmental problems without a public that cares. It is this that is inspiring her to secure support for continuing the project, and why one of her favourite OPAL moments came while working with a group of young offenders from Southwark. Strolling back after a day in the park, one young man turned to her and said, simply: "Trees are the greatest." Now that's a good peer review.



## get involved

Encourage friends, family and colleagues to take part in OPAL surveys and help scientists build up a more accurate picture of England's natural environment:  
[www.opalexplornature.org/surveys](http://www.opalexplornature.org/surveys)

**AIR SURVEY:** monitor lichens and tar spot fungus to track local air quality

**BIODIVERSITY SURVEY:** find out which hedgerows attract the most wildlife

**BUILT ENVIRONMENT SURVEY:** discover how invertebrates cope with urban living by identifying bugs on your doorstep

**CLIMATE SURVEY:** help improve the accuracy of computer climate models, assess our sensitivity to changing temperatures and measure how we affect wind speed and direction

**SOIL AND EARTH-WORM SURVEY:** check soil condition and contribute to a national map of earthworm species

**WATER SURVEY:** survey plants and animals in local lakes and ponds to find out more about water quality



1

425,000 PARTICIPANTS HAVE COLLECTED WILDLIFE AND HABITAT DATA FROM 11,000 SITES AROUND ENGLAND



2



3



4

1 OPAL Director Linda Davies () launches the Climate Survey // 2 The OPAL Air Centre at Silwood Park Campus looks at the effect of pollution on plants. // 3 Counting species in local hedgerows helps OPAL identify biodiversity hotspots. // 4 Life is looking up for hedgehogs in East Hull where residents are working with scientists on a project to conserve them. // 5 Wildlife expert Chris Packham presents a specimen of one of the world's longest earthworms, *Megascolides australis*, to launch the Soil and Earthworm Survey with students from St Albans School.



5



# Into Africa

Academic paediatrician Dr Beate Kampmann's recent appointment as Head of Vaccinology at the Medical Research Council unit in the Gambia has helped fulfil her long-held ambition of bringing laboratory and field work closer. Her work on tuberculosis in children has involved setting up an open lab between research sites in West Africa and at Imperial in London, where she is a Reader in Paediatric Infection and Immunity. But closer international collaborations and a dedication to improving global health still require time spent travelling, she tells **Tim Radford**.

Beate's open lab approach means that a team of over 80 African and European staff has the opportunity to work in both countries, leading to a shared vision for the research, more teaching opportunities, and ultimately better prevention and patient care.

The model gives everyone access to state-of-the-art laboratory equipment. European scientists get to see first-hand what tuberculosis (TB) and other infections do to children in Africa. TB is a global hazard but it claims very few lives in Britain. "In developing countries, most problems arise because the treatment is given too late, when the lungs have collapsed or the TB has reached the central nervous system or bones", Beate explains. "That is not going to change very quickly, which is why we still need a better vaccine."

Brought up near Cologne in Germany, Beate (PhD Paediatrics, Obstetrics and Gynaecology 2000) knew she wanted to be doctor from a young age. She studied paediatric medicine in the UK, and began to ask questions: "Why did this child become seriously ill with this disease, while that child walked out of casualty with the same bug and nothing much happened?"

An interest in HIV and TB took her to Africa, and another puzzle. The BCG vaccine against TB has been available for more than eight decades. "It is the world's most widely used vaccine, and we still don't really know why it works in some people and not in others."

#### TRAVELLING LIGHT

Looking for ways of solving such problems keeps Beate on the move: "When you work in global health, travel becomes part of the package. You have to go where the action is," she says. "We are not great on carbon footprints." She flies to the Gambia for 10 days or so every other month. It

takes six hours. She gets picked up at the airport and can be in the lab in half an hour.

"I have a house there. If I left here now, with a credit card, passport, laptop and my office keys, I'd be all right. I wouldn't need much else, apart from my noise reduction headphones. I have grown very fond of those. Before the Gambia, I was travelling to Cape Town a lot and it's a 12-hour flight overnight. When you are in economy, 12 hours sitting up is a long time." She also has a travel pillow, a small thing with rice grain sized stuffing that can form any shape, and socks for keeping her feet comfortable.

#### OFF THE BEATEN TRACK

Once in the Gambia, there's sometimes a five or six-hour Land Rover ride from the main laboratory on the coast along dirt roads to rural research sites inland. "Infection patterns can vary significantly between different communities, and it's important to take the full range of conditions into account," explains Beate. "For example, malnutrition is more common in rural areas, often making children more vulnerable to diseases."

When we meet, Beate has just returned from a work trip that this time included some travel with her family – the writer and journalist James Cusick and their son, Sebastian. "The inland rural areas offer a different flavour from the more tourist-oriented coastal towns and villages. Each morning we were woken by an extraordinary concert of birdsong. We also got to travel down the Gambia river by boat, which is where you see the real beauty of the country." Sebastian started travelling the world in a sling with his mother, when he was just six weeks old. "When he was 11, he said to me: 'Mama, I can fly to Cape Town by myself next year; that will be my New Year's resolution.' We make an excellent travel team."



A man and a woman are dancing in a modern, brightly lit hallway. The woman is wearing a vibrant red dress and black heels, while the man is in a purple shirt and dark trousers. They are in a close embrace, with the man's hands on the woman's waist and shoulders. The hallway has a high ceiling with a grid of lights and large windows that reflect the interior. The overall atmosphere is elegant and sophisticated.

# Light fantastic

By day, Professor Martin McCall (Physics 1983) bends light around space and time, deriving equations that hide objects and events in Harry Potteresque fashion. Two nights a week however, the theoretical optical physicist shrugs off his academic mantle, dons a smooth-soled pair of shoes and sets out for the dance floor. Martin's wife Estralita first encouraged him to join a Ceroc class with her eight years ago. He confides: "when I started I had two left feet, and was at least as nervous as when I gave my recent inaugural lecture". Time spent practising this fusion of jive and salsa has clearly not been wasted, as he fluently leads and spins Estralita around campus for this photoshoot. "Dancing gives me a refreshingly different way of socialising with people," says Martin. "The only connection with physics is that I choreograph my work trips to coincide with dancing events whenever possible." One of his main collaborators works in New Zealand, where the local Ceroc teacher reserves a music track for the student who has travelled furthest to be at her class. With 12,000 miles under his belt, Martin can be confident that she will save the last dance for him.

*Photo by Adrian Weinbrecht, on location under the Faculty Building looking towards the Queen's Tower.*





The Grantham Institute for Climate Change welcomes natural history film maker Sir David Attenborough for a Q&A session with staff and students.



Professors Paul Elliott, Jaspal Kooner and Philippe Froguel (l to r) celebrate the launch of Imperial's School of Public Health.



Singapore's High Commissioner, His Excellency Michael Eng Cheng Teo, opens the London project office at Imperial for the Lee Kong Chian School of Medicine.



Friends, family and colleagues gather at a memorial event to celebrate the life and work of Lord Flowers (1924-2010), one of Imperial's most popular Rectors.

GOOD RECEPTION



Professor Colin Caro discusses the helical arterial stent he invented with a young visitor at the Science Museum, where it is exhibited in the new biomedical gallery.



Professor Wendy Barclay leads her team of Imperial researchers and *New Scientist* journalists to victory in the College's first Big Science Pub Quiz.



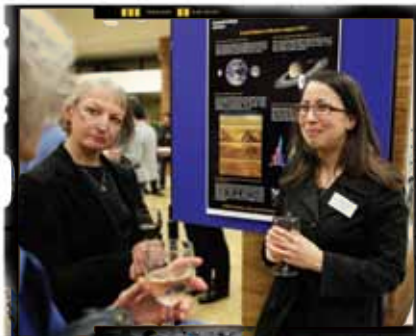
Unsuspecting Rector, Sir Keith O'Nions, falls prey to students throwing custard pies on the Queen's Lawn to mark the start of RAG week.



Federal Aviation Authority executive Tweet Coleman is interviewed for the Imperial podcast at the launch of the Energy Futures Lab's Green Aviation research network.



Professor Winston Wong (Physics 1971, MSc 1972, PhD Chemical Engineering and Chemical Technology 1976) joined over 70 other guests at the Taipei alumni reception.



Planetary scientist Dr Leah-Nani Alconcel (r) discusses her research with visitors at the Kohn Award lecture reception, prior to taking the Aurora Explorer exhibit to the 2011 Royal Society Summer Science Exhibition.



Shadow Minister for innovation and science Chi Onwurah MP (Electrical Engineering 1987) (r) visits the Imperial College Incubator.

PHOTOS: (DAVID ATTENBOROUGH) KATE LUCKETT, (PUBLIC HEALTH, SINGAPORE, SCIENCE MUSEUM, KOHN, GREEN AVIATION) LAYTON THOMPSON, (FLOWERS, BIG SCIENCE) CAROLINE PREW, (CHI ONWURAH) JODY KINGZETT, (RECTOR) JAKE GREEN

# The little black box

Whenever we hear of a plane crash, the report inevitably turns at some point to the recovery and analysis of the aircraft's 'black boxes', known formally as the Cockpit Voice Recorder and Flight Data Recorder.

Born in 1925 on Groote Eylandt, Australia, Dr David Warren was one of four children to parents Hubert Warren and Ellie Potter. His father, an Anglican missionary, died in an unsolved plane crash when David was nine years old.

After studying chemistry at the University of Sydney, David taught at Geelong Grammar School in Victoria and then later at Sydney, and in 1948 he was appointed the Scientific Officer at Woomera Rocket Range. His research into rocket fuel brought him to Imperial in 1949, where he took a PhD in chemical engineering.

In 1952 he returned to Melbourne to work at the Aeronautical Research Laboratories (ARL) as principal research scientist. A year later he was invited to join the technical committee investigating two fatal De Havilland Comet jetliner crashes; the accidents remained unsolved and led David to begin developing his idea for an in-flight recording device. "I had seen, at a trade fair, a gadget which fascinated me," he later explained. "It was the world's first miniature recorder to put in your pocket. I put the two ideas together. If a businessman had been using one of these in the plane and we could find it in the wreckage and we played it back, we'd say, 'We know what caused this.'"

His idea was not well received initially. Pilots rejected the concept, fearing that black boxes might be used to spy on crew. The Royal Australian Air Force did not think the device was required and that "the recorder would yield more expletives than explanations". Despite



*Dr David Ronald De Mey Warren (PhD Chemical Engineering and Applied Chemistry 1950) 1925–2010*

the lack of support, David outlined his idea in a 1954 paper and by 1956 he had created a prototype, named the ARL Flight Memory Unit, which allowed the storage of up to four hours of voice and flight-instrument data.

It was not until 1958, when the Secretary of the UK Air Registration Board visited ARL that Warren's ideas were finally taken seriously. Sir Robert Hardingham brought David back to London and after a resounding response to demonstrations of the prototype, a company was contracted to make the devices, which have always been coloured red.

In 1963, following two fatal aviation disasters, Australia became the first country to make flight recorders a mandatory legal requirement. Despite never receiving financial reward for his invention, in recent years Warren's contribution to aviation safety was officially recognised. In the 2002 Australia Day honours list, he was made an Officer of the Order of Australia and in 2008 Qantas named one of its Airbus A380 aircrafts after him. David is survived by his wife, Ruth, four children, eight grandchildren, one great-grandchild and a sister.



*Dr Judit Nagy (PhD Biochemistry 1997) 1963–2010*

## Proteomics pioneer

Dr Judit Nagy was born in Budapest in 1963 and studied chemistry at the Eötvös Loránd University in Hungary and went on to study for a Master's in neutron-activation analysis.

In 1993 Judit embarked on a doctorate at Imperial, where she remained for the rest of her career, studying the role that an

enzyme plays in the activation of a drug used in the treatment of tuberculosis. Her interest in the molecular basis of disease and therapy inspired much of her subsequent research. In 2000, Judit established her independent research activities as the manager of the proteomics facility in the newly established Centre for

Molecular Microbiology and Infection and, in 2006, she moved her laboratory into the Institute of Biomedical Engineering, where the additional resources allowed her work to flourish.

Judit died in a car accident on 18 October 2010. She is survived by her husband and four children.

# In memoriam

We regret to announce the deaths of the following alumni, staff and students of Imperial College London, the constituent medical schools and Wye College.

Alumni are listed by decade of graduation. Where an alumnus has obtained more than one degree from the College they are listed under the decade in which they obtained their first degree. An asterisk (\*) indicates that an obituary for this alumnus is available online at at [www.imperial.ac.uk/alumni/obituaries](http://www.imperial.ac.uk/alumni/obituaries). A dagger (†) indicates that the alumnus was also a member of staff. Printed copies of obituaries are also available on request from [alumni@imperial.ac.uk](mailto:alumni@imperial.ac.uk)

## 1930s

- Mr Alan Baker (Mechanical Engineering and Motive Power 1937)
- Dr Leslie A. Bashford (Chemistry 1935, PhD 1937)
- Emeritus Professor Hans A. Buchdahl (Physics 1939)
- Mr Dinaker P. Dani (Mechanical Engineering and Motive Power 1939)\*
- Dr Arthur L. Down (Chemistry 1937, PhD Geology 1939)
- Professor Emeritus Sir Hugh Ford (Mechanical Engineering and Motive Power 1936, PhD 1939)†\*
- Dr Paul Freeman (Biology 1937, Botany 1938)\*
- Dr Raymond I. Garrod (Physics 1938, PhD 1939)
- Mr Wilfred L. Hewlett (Chemistry 1933)\*
- Mr Abraham A. Jacobs (Chemistry 1939)
- Mr Ronald D. Kitchener (Electrical Engineering 1939, MSc 1940)
- Mr George R. Owen (Electrical Engineering 1939)
- Mr Wilfred C. Pafford (Electrical Engineering 1930, DIC 1931)\*
- Mr Eric L. Ripley (Physics 1939)
- Professor Jack Rutter (Botany 1938)†\*
- Mr Edmund O. Skelton (Mining 1934)
- Mr Vincent E.W. Stewart (Civil Engineering and Surveying 1934)
- Mr Roger P. Stokes (Mechanical Engineering and Motive Power 1937)

## 1940s

- Dr Timothy M. Aluko (Civil Engineering and Surveying 1948)\*
- Mr James A.C. Andrews (Civil Engineering and Surveying 1947)\*
- Professor Edward M. Beckett (Charing Cross and Westminster Medical School 1944)
- Mr John A. Bennett-Powell (Mechanical Engineering and Motive Power 1940)
- Mr William Berwick-Sayers (Electrical Engineering 1949)
- Dr Charles A. Biscoe (St Mary's Hospital Medical School 1949)\*
- Dr Wilfred S. Brown (Charing Cross Hospital Medical School 1948)\*

- Mr Geoffrey A. Church (Mechanical Engineering and Motive Power 1942)
- Mr Eric R. Cox (Electrical Engineering 1949)
- Mrs Pamela Crayton (Botany 1949)
- Professor Michael C. De Malherbe (PhD Mechanical Engineering and Motive Power 1945)
- Mr Gordon S. Dear (Electrical Engineering 1943)
- Mrs P.J. Dewey (Wye College 1945)
- Dr John R. Drabble (Mathematics and Mechanics 1943, PhD 1949)\*
- Professor George E.P.H. Du Boulay (Charing Cross Hospital Medical School 1945)
- Dr Anthony W. Edridge (Westminster Hospital Medical School 1944)
- Dr Frank Ellis (Mechanical Engineering and Motive Power 1949, PhD Mechanical Engineering 1961)†\*
- Professor John A. Elvidge (Chemistry 1943, PhD 1947)\*
- Dr Ernest W. Emery (Physics 1947)
- Dr David L. Evans (Westminster Hospital Medical School 1942)
- Mr Heinz L. Feuchtwanger (Chemistry 1946)
- Mr Morley H. Freeman OBE (Meteorology 1944)
- David Gibson (Mining 1948)
- Dr John M. Grocock (Chemistry 1949, PhD 1952)
- Professor Jack Halling (Mechanical Engineering and Motive Power 1948, PhD Mechanical Engineering 1952)
- Mr Denys S. Hopper (Physics 1943)
- Mr Barclay G. Humphrys (Civil Engineering and Surveying 1942)\*
- Professor George Jackson (Aeronautics 1947)
- Dr Anthony H. James (St Mary's Hospital Medical School 1944)
- Dr Clive R. Jolly (Charing Cross Hospital Medical School 1948)
- Mr James E.B. Kiddell (Mechanical Engineering and Motive Power 1943)
- Professor Peter T. Landsberg (PhD Mathematics and Mechanics 1949)
- Dr Max M.M. Lipsicas (Electrical Engineering 1948, Physics 1950)

- Mr George Mann (Physics 1942)
- Mr Ross W. Meadows (Electrical Engineering 1940)
- Dr Alan C. Meigh (Civil Engineering and Surveying 1949, MSc Civil Engineering 1950)
- Mr Thomas D. Meyler (Electrical Engineering 1947)
- Mr Henry P.A. Moser (Mechanical Engineering and Motive Power 1941)
- Mr Frederick H. Needham (Civil Engineering and Surveying 1948)
- Mr John A. Neill (Civil Engineering and Surveying 1946, DIC 1947)
- Professor Donald W. Pashley (Physics 1947, PhD 1950)
- Sir Norman J. Payne CBE (Civil Engineering and Surveying 1948)
- Dr Peter F. Philip (Charing Cross Hospital Medical School 1945)
- Mr Basil N. Robbins (Chemical Technology 1943)\*
- Mrs Joyce A. Russell (Chemistry 1948, PhD Botany 1950)
- Professor Roy G. Shorter (Westminster Hospital Medical School 1948)
- Mr Clifton J. Stanford (Electrical Engineering 1944)

## 1950s

- Dr Hilary J. Andrews (Charing Cross Hospital Medical School 1955)
- Mr R.H. Bennisson (Wye College 1954)
- Mr Rex W. Bird (Civil Engineering 1954)
- Mr Leslie L. Edwards (Mathematics and Mechanics 1953)
- Mr Richard C.J. Edwards (Mining 1952)\*
- Mrs Brynhild J. Felton (Physics 1952)
- Mr Roger Fisher (Mechanical Engineering 1952, MSc Civil Engineering 1954)\*
- Mr Ian J. Flint (Mechanical Engineering 1958)
- Mr Bryan O. Frost (Chemical Engineering and Applied Chemistry 1954)
- Air Vice-Marshal Philip M.S. Hedgeland (Electrical Engineering 1951)
- Dr Brian Higgs (Westminster Hospital Medical School 1959)
- Dr W.D. Hopkins (Westminster Hospital Medical School 1950)
- Dr John R. Jay (PhD Mining 1959)



- Dr Dennis Kelsall (PhD Physics 1958)\*
- Dr Lindon C. Laming (PhD Mechanical Engineering 1952)†
- Mr William G.D. Larrett (Physics 1953)
- Professor Manfred Lehmann (Mathematics and Mechanics 1953, PhD Mathematics 1956) †\*
- Mr Peter A. May (Mathematics and Mechanics 1953)
- Professor Colin R. McChesney (Mechanical Engineering 1956)
- Dr Robert M. Moffitt (St Mary's Hospital Medical School 1956)
- Mr Brian E. Nelson (Aeronautics 1959)\*
- Mr Henry M. Pailsey (Physics 1954)
- Mr Michael W. Preuveneres (Chemistry 1958)\*
- Mr Raju Retnasami (Electrical Engineering 1958)
- Mr Nicholas Robb (Metallurgy 1950)
- Dr John Russell (PhD Botany 1951)
- Dr Geoffrey H. Ryder (Charing Cross Hospital Medical School 1955)
- Mr Colin F. Smith (Mining 1958)\*
- Mr David A. Smith (Civil Engineering and Surveying 1950)
- Mr Vernon J.N. Snellock (Mechanical Engineering 1956)
- Professor Kenneth A. Stacey (PhD Chemistry 1951)
- Dr William I. Stanton (Geology 1951, PhD 1953)
- Dr John R. Stubbles (PhD Metallurgy 1957)
- Dr Robert B. Turtle (Chemical Engineering and Applied Chemistry 1952)
- Mr John Tze-Tsun Wang (Chemistry 1956)
- Mr Robin Waugh (Physics 1958)
- Mr Richard F. Whidborne (Civil Engineering 1950)
- Mr R.J. Wilkins (Electrical Engineering 1950)
- Dr E.R. Wilson (Westminster Hospital Medical School 1951)

## 1960s

- Dr Baderuddin Afghan (PhD Chemistry 1966)
- Dr Henry W.E. Briscoe (St Mary's Hospital Medical School 1961)
- Dr Michael L. Brown (PhD Chemical Engineering and Chemical Technology 1969)\*
- Dr Paul A. Bryant (PhD Physics 1964)

- Mr Steven C.B. Bullock (Wye College 1960)
- Dr Anthony F. Collings (PhD Chemical Engineering and Chemical Technology 1966)\*
- Dr Peter G. Cutler (Westminster Hospital Medical School 1967)\*
- Mrs Katrina Dalton (Wye College 1969)
- Mr Peter L. Dowell (Electrical Engineering 1961)
- Mr Keith A. Duke (Mechanical Engineering 1967)
- Professor David J. Faulkner (Chemistry 1962, PhD 1965)
- Mr David F. Ferguson (Aeronautics 1965)\*
- Mr Arthur D. Fotheringham (Physics 1962)
- Mr Muhammad S. Gabru (Civil Engineering 1963)
- Dr Philippa K. Griffiths (Charing Cross Hospital Medical School 1969)
- Mr Andrew C. Guest (Metallurgy 1968, MSc Mechanical Engineering 1969)
- Mr Ajmal I. Hussain (Civil Engineering 1964)
- Professor William I. Jenkins (Chemistry 1963, PhD 1966)
- Mr Alan L. Jones (Electrical Engineering 1968)
- Mr Norman L. Kent (Physics 1961)
- Dr Linden J. Morris (Civil Engineering 1960, 1964)
- Mrs Joan F.C. Reeves (Physics 1965, MSc Electrical Engineering 1968)
- Dr Peter C. Shervington (St Mary's Hospital Medical School 1961)
- Mr Donald C. Thomson (Chemical Engineering and Chemical Technology 1961)
- Professor David L. Trimm (DIC Chemical Engineering and Chemical Technology 1962)\*
- Dr Yilmaz Turan (Geology 1961)
- Mr Peter F. Vermeylen (Electrical Engineering 1960)

## 1970s

- Mr James A. Botterill (Aeronautics 1972)
- Dr David N. Clark (PhD Geology 1975)\*
- Mr Michael J. Gibson (Physics 1977)
- Dr Herbert Gomes (MSc Mathematics 1976)
- Mr Michael D. Grantham (Civil Engineering 1970)
- Mr Andrew C. Grochowski (Physics 1971)
- Mr Arie Hepp (Botany and Plant Technology 1973)
- Dr Shorland W. Hosking (Charing Cross Hospital Medical School 1978)
- Professor Joseph A.C. Humphrey (Mechanical Engineering 1974, PhD 1977)
- Mr Hicuunga K.E. Kambaila (Mining and Mineral Technology 1971)
- Mr Paul O. Langguth (Chemistry 1978)
- Dr John P. Lee (Westminster Hospital Medical School 1971)\*
- Mr Philip Marriott (Mineral Resources Engineering 1979)
- Mr Roger D.A. Phillips (Electrical Engineering 1972)\*
- Dr Patri J. Pugliese (History of Science, Technology 1977)
- Mr Martin F.G. Smeaton (Physics 1976)
- Eur Ing Julia M. Tranmer (Chemical Engineering and Chemical Technology 1976, 1980)
- Mr Stephen J. Williams (Chemistry 1973)
- Mr Richard W. Wood (Mechanical Engineering 1975)

## 1980s

- Mr Shane E. Ahmet (Physics 1987)\*
- Dr Graham J. Belham (Westminster Hospital Medical School 1980)
- Mr Sundeep B. Chauhan (Chemical Engineering and Chemical Technology 1986, Management School 2000)
- Mr Christopher K. Chew (MSc Social and Economic Studies 1984)
- Mr Peter S. Graham (Mechanical Engineering 1981)
- Mr Richard L. Hughes (Civil Engineering 1987, MSc 1988)
- Dr Ashok Kumar (Aeronautics 1985)
- Mr Raphael Salasini (MSc Computing 1988)
- Mr Bernard C.J. Smith (Physics 1980)
- Ms Rosemary M. Thomson (Biochemistry 1987)
- Mr Janusz A.J. Trzebski (Wye College 1984)
- Mr Anthony H.S. Wickham (Civil Engineering 1983)
- Mr Neil A. Burroughs (Physics 1993)
- Mr Dominic Clay (Geology 1997)
- Dr Joachim Eggeling (Chemistry 1995, PhD 1999)
- Mr Mark A. Gialanze (Physics 1990)
- Mr Simon H. Lloyd (MSc Electrical and Electronic Engineering 1992)
- Mr Medhat Mansi (Mechanical Engineering 1995)
- Mr Neil D. McColl (Management School 1992)
- Dr Alexander C.N. Nzuruba (Environmental Technology 1996)\*
- Dr Henryk J. Salacinski (MSc Chemistry 1990)
- Ms Cressida C.A. Spachis (Civil Engineering 1998)

## 1990s

- Miss Amy F. Austin (Biology 2001)
- Mr Jonathan R. Fernando (Mathematics 2003)
- Mr Amer M. Hussein (Mathematics 2002)
- Ms Katrina Jacks (Chemical Engineering and Chemical Technology 2009)
- Mr Paul Le Begue de Germiny (MSc Business School 2006)
- Lieutenant Neal Turkington (MSc Civil and Environmental Engineering 2007)

## 2000s

- Mr Anthony Soh (Mechanical Engineering)

## Students

- Mr Anthony Soh (Mechanical Engineering)

## Staff

- Mr Brian Doble
- Mr Aiden Donnelly
- The Lord Flowers
- Mr John F. Greenwood
- Mr Simon P. Hill
- Mrs Karen Jones
- Professor John Nelder
- Professor Jaroslav Stark
- Emeritus Professor Michael Way
- Dr Bryon Wilson

To enquire about leaving a legacy to Imperial in your will, please contact Rosalind Griffin on **+44 (0)20 7594 6159** or email [rosalind.griffin@imperial.ac.uk](mailto:rosalind.griffin@imperial.ac.uk)



## Stay connected

There are over 55 alumni groups in countries around the world and 12 discipline and heritage groups based in the UK. Find out if there is a group near you.

• [www.imperial.ac.uk/alumni/groups](http://www.imperial.ac.uk/alumni/groups)

For help contacting your classmates and guidance on the organisation of your event, contact: Louise Birrell on +44 (0)20 7594 6130 or at [louise.birrell@imperial.ac.uk](mailto:louise.birrell@imperial.ac.uk)

## Questions?

Alumni membership is free. Contact the Alumni Office for help with issues concerning membership or services.

Email: [alumni@imperial.ac.uk](mailto:alumni@imperial.ac.uk)  
Phone: +44 (0)20 7594 6138  
Post: Alumni Office,  
Imperial College London,  
Level 2 Faculty Building,  
South Kensington Campus,  
London SW7 2AZ, UK

• [www.imperial.ac.uk/alumni](http://www.imperial.ac.uk/alumni)

# /noticeboard

## ALUMNI GROUPS

### Regional

#### KAZAKHSTAN

Newly established alumni group is recruiting new members. Contact: [alumni@imperial.ac.uk](mailto:alumni@imperial.ac.uk)

#### MALAYSIA

Recruiting new members! Next event: Networking Gala on Friday 29 July. Join online at [www.icaam.org.my/register-now](http://www.icaam.org.my/register-now)

### Sport

#### FOOTBALL

*ICUFC Veterans Football Club*

Former ICUFC players, or those otherwise interested in playing, are most welcome to join this new group. Contact: [alumni@imperial.ac.uk](mailto:alumni@imperial.ac.uk)

#### FENCING

*Imperial Alumni Fencing Club*

A new group has launched for former Imperial fencers, and those who have taken up the sport after graduating, interested in socials, club sessions and matches.

Contact: [alumni@imperial.ac.uk](mailto:alumni@imperial.ac.uk)

## REUNIONS

### Class reunions

#### AERONAUTICS 1971

Saturday 16 July 2011, South Kensington Campus, London. Contact: Tim Smith at [timsmith11@waitrose.com](mailto:timsmith11@waitrose.com)

#### CHEMICAL ENGINEERING 1961

Saturday 16 September 2011, South Kensington Campus, London. Contact: Chris Marchant at [marchant.chris@googlemail.com](mailto:marchant.chris@googlemail.com)

#### CHEMISTRY 1961

Friday 23 to Sunday 25 September 2011, South Kensington Campus, London. Contact: Stephen Robinson at [stephenrobinson\\_3@hotmail.com](mailto:stephenrobinson_3@hotmail.com)

#### COMPUTING 1986 (UNDERGRADUATE)

Date to be confirmed, London. Contact: Stephen Zatland at [stephen.zatland@accenture.com](mailto:stephen.zatland@accenture.com)

#### EARTH SCIENCE AND ENGINEERING 1964

Wednesday 31 August 2011, South Kensington Campus, London. Contact: Julian Bennett at [julian.bennett@btinternet.com](mailto:julian.bennett@btinternet.com)

#### ELECTRICAL ENGINEERING 1981

Saturday 17 September 2011, South Kensington Campus, London. Contact: Alan Higginson at [alan.r.higginson@btinternet.com](mailto:alan.r.higginson@btinternet.com)

## DISCOUNTS

### COMPLIMENTARY ROOM HIRE ON CAMPUS

The College is offering complimentary room hire for all Imperial alumni events taking place before 31 December 2011 (based on minimum numbers of 20 guests and a minimum catering spend of £20 per person). [www.imperial.ac.uk/alumni/conferencefacilities](http://www.imperial.ac.uk/alumni/conferencefacilities)

### CONTINUING PROFESSIONAL DEVELOPMENT

Alumni are entitled to a 10 per cent discount on the cost of all courses offered by the School of Professional Development. Please quote your alumni membership number at time of booking to take advantage of this discount. [www.imperial.ac.uk/cpd](http://www.imperial.ac.uk/cpd)

## LOST ALUMNI

The College always seeks the most up-to-date contact details for alumni but we have lost touch with those named below who other alumni want to reach. If you can help please contact [alumni@imperial.ac.uk](mailto:alumni@imperial.ac.uk)

- Dr Barry W. Hyndham (PhD Electrical Engineering 1970)
- Siong P. Ng (Mechanical Engineering 1972)
- Neil Ramsbottom (Mechanical Engineering 1961)
- Richard T. Sunderland (Electrical Engineering 1968)
- Rosalyn J. Symes (MSc Geology 1977)
- John P. Tunstall (Botany 1951)

# calendar

EVENTS + MEETINGS + OCCASIONS

30 JUNE

COME AND VISIT

## Open Day

Prospective students and parents visit campus and find out what it's really like to be a student at Imperial.

[www.imperial.ac.uk/visit](http://www.imperial.ac.uk/visit)

South Kensington Campus, London



25 JULY

ON THE ROAD

## New York alumni meet-up

Join Sir Keith O'Nions, Rector of Imperial, and fellow alumni for his talk at the British Consulate about *Where science is going*.

[www.imperial.ac.uk/alumni/newyork](http://www.imperial.ac.uk/alumni/newyork)

New York, USA



11 AUGUST

ON THE ROAD

## Singapore alumni meet-up

Rector Sir Keith O'Nions will host an alumni drinks reception one year on from the launch of the Lee Kong Chian School of Medicine.

[www.imperial.ac.uk/alumni/singapore](http://www.imperial.ac.uk/alumni/singapore)

Singapore



12 AUGUST

ON THE ROAD

## Hong Kong alumni meet-up

Come and meet Sir Keith O'Nions and fellow alumni in Hong Kong and hear his talk about *Where science is going*.

[www.imperial.ac.uk/alumni/hongkong](http://www.imperial.ac.uk/alumni/hongkong)

Hong Kong

20 SEPTEMBER

ON THE ROAD

## Geneva alumni meet-up

The Rector of Imperial, Sir Keith O'Nions, will address alumni in Geneva, home to the world's largest particle accelerator.

[www.imperial.ac.uk/alumni/geneva](http://www.imperial.ac.uk/alumni/geneva)

Geneva, Switzerland



23 SEPTEMBER

AFTER HOURS

## Science Uncovered

Visit Imperial researchers at our neighbouring Natural History Museum's after-hours event – part of this year's Europe-wide festival of science and research. Catch live demonstrations, chat to scientists at the bar or take a tour.

Natural History Museum, London



19 OCTOBER

GRADUATION

## Commemoration Day

Over 2,000 undergraduates celebrate their achievements and mark the beginning of an amazing journey as an Imperial alumnus.

[www.imperial.ac.uk/graduation](http://www.imperial.ac.uk/graduation)

Royal Albert Hall, London



22 NOVEMBER

SCHRÖDINGER LECTURE

## What is life?

Sir Paul Nurse, President of the Royal Society, gives the 2011 lecture, inspired by Erwin Schrödinger's book *What is life?*

[www.imperial.ac.uk/events/schrodinger2011](http://www.imperial.ac.uk/events/schrodinger2011)

South Kensington Campus, London

NOVEMBER/DECEMBER

ON THE ROAD

## India alumni meet-up

Sir Keith O'Nions, Imperial's Rector, will be hosting events in Mumbai, Kolkata and Delhi during his Indian tour.

[www.imperial.ac.uk/events](http://www.imperial.ac.uk/events)

Mumbai, Kolkata and New Delhi



12 MAY 2012

REUNION

## Imperial Day

The Imperial alumni reunion takes a fresh approach with tours, talks and demonstrations throughout the day (see back cover).

[www.imperial.ac.uk/imperialday](http://www.imperial.ac.uk/imperialday)

South Kensington Campus, London



For more details on Imperial College events, visit:  
[www.imperial.ac.uk/events](http://www.imperial.ac.uk/events)



Sign up and receive the e-Bulletin every fortnight by emailing:  
[imperial-events-join@imperial.ac.uk](mailto:imperial-events-join@imperial.ac.uk)



Imperial College  
London



# Imperial Day

coming up + + +

12 MAY 2012 • LONDON

Reunite with former classmates and experience the best of the Imperial College London today. The Alumni Office is busy planning a new approach to the annual reunion which will take place next year on Saturday 12 May 2012 at the South Kensington Campus as part of the two-day Imperial Festival. All alumni will receive details in due course but for now please mark the date in your diary. We hope to see you there.

[www.imperial.ac.uk/imperialday](http://www.imperial.ac.uk/imperialday)

*Connecting alumni to extend the Imperial network around the world*