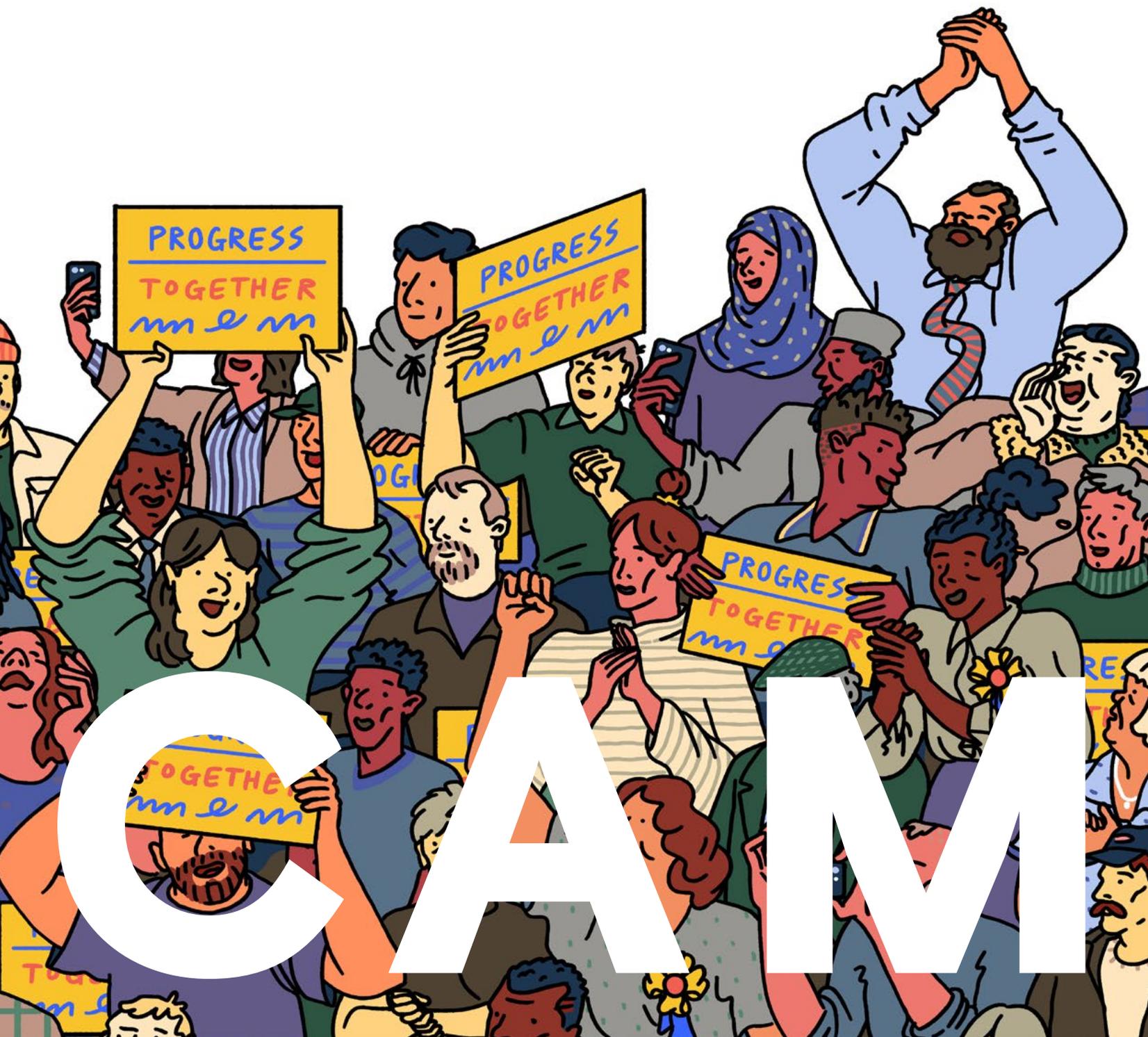


Every politician knows that the ultimate power trip is charisma.

Machine learning is shaping our world. Which is why you need to understand how it works.

Why has the humble Petri dish remained at the cutting edge?



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Cambridge Alumni Magazine
Issue 85 Michaelmas 2018

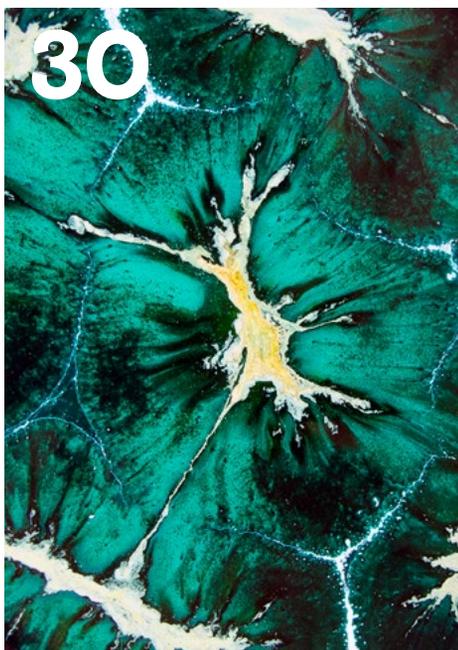
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Cover

Illustration by Chester Holme.

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The University of Cambridge. CAM is published three times a year, in the Lent, Easter and Michaelmas terms, and is sent free to Cambridge alumni. It is available to non-alumni on subscription. For further information please email contact@alumni.cam.ac.uk.

The opinions expressed in CAM are those of the contributors and not necessarily those of the University of Cambridge.

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Editor's letter

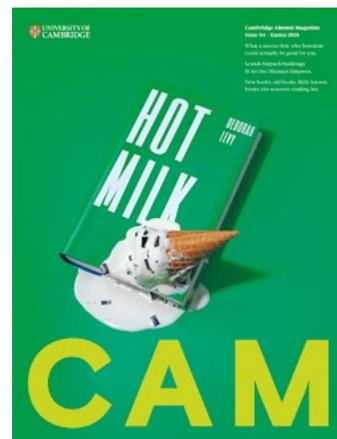
Welcome to the Michaelmas edition of CAM. From Trump and Boris to May and Merkel, charisma – or lack thereof – has never played such a crucial role in politics. On page 14 we examine the weird, compelling, sometimes overwhelming, power of charisma: what it is, why it has such an effect and whether it is possible to resist.

The Junior Common Room, or as it is also known, the JCR, the student union (or, at Peterhouse, the Sexcentenary – Sex – Club) is at the very heart of student politics. As well as being the main way in which undergraduates can make an impact on student life (not to mention the quality of the May Ball), College JCRs provide a continual internal challenge, pushing Colleges forward.

On page 36, we find out what it is really like to serve on the JCR and talk to current committee members about what's on their agenda. Elsewhere, on page 26, Professor Bhaskar Vira explains why protecting the natural world is not just about resources but also about wellbeing, and on page 30 we tell the story of why the humble Petri dish remains at the cutting edge of scientific discovery.

And on page 20, we explain the principles of machine learning. As ever, on all these topics, we look forward to your contribution to the debate, whether by post, email or on social media.

Mira Katbamna (Caius 1995)



Inbox

Between the lines

✉ Some witty illustrations for summer reads in CAM 84. But please, can we have your urgent reassurance that no real books were harmed in creating the artwork?

Nigel Watson
(Pembroke 1970)

Busy doing nothing

✉ I fully endorse the sentiments of your article on boredom. Speaking as a member of the pre-internet generation, my memories of summer holidays, Sundays and quite a lot of the rest of the time (when not studying or working briefly at my Saturday job mornings only – at the local newsagent) are of fully-formed boredom. So I'm relieved to find out from your excellent article that, in fact, it was good for me after all. And, of course, it did force one to read quite a bit.

PS: I was trying to throw out some of the back issues of CAM in a 'start of the holidays boredom' kind of way, but I've only managed to assign one to the bin so far – too many interesting things, too many memories jogged. How annoying!

Jill Burton
(Homerton 1981)

✉ As a lifelong practitioner of actively doing nothing – DMN [default mode network], mindfulness – I am outraged by the idea that boredom is part of the mix. It isn't. My guilt-free, empty mind becomes a receptacle for all kinds of



intellectual activity: pondering anarchy, banning the Tory party, inventing a device to stop walking sticks falling over.

My mother years ago: “Don’t just sit there Sara, do something.” My answer: “I’m thinking.” It seems Descartes had the same problem.

Sara Sharpe
(*Newnham 1955*)

Great article about #neuroscience, #mindfulness and #boredom. “To experience, in other words, that itchy sensation of boredom – and go deeper into it, filling it with #meaning.”

Elanor Kortland
(*New Hall 1991*)

On *Boredom* contrasted “thinkers of previous centuries”, who believed that boredom “is a crime”, with recent research that suggests that boredom is productive. But this does scant justice to many thinkers, such as Goethe, who long ago wrote: “Let boredom be hailed as the mother of the Muses”.

Endymion Wilkinson
(*King’s 1960*)

New tricks for older brains

I’m almost 88 and routinely lose my glasses three or four times a day after taking them off to read or look at something more closely. They could be anywhere: in the house, garden or workshop, or even on the top of my car engine! Professor Kourtzi’s suggestion to ask “Where is a safe place to put ...” means that I now know exactly where I left my

glasses. A simple suggestion, with significant benefit to me, but not one I would have thought of.

John Bradley
(*Darwin 1988*)

Up the tower

Contrary to what readers in the North Wing may think at certain times of the year, the UL does have a heating system, located directly below the reception area – and its chimney is at the very top of the UL tower. In other words, the tower hides the chimney – so maybe it was a case of making a virtue out of necessity. The original drawings show how the Library might have appeared without its tower – nothing like as majestic as it is.

Richard Holroyd
(*St John’s 1968*)

On holiday in Switzerland with three friends in 1959, we found ourselves unable to solve a wooden puzzle which had been given away by the magazine *Tit-Bits* some 20 years previously.

No problem. Next term: a quick trip to the UL, a short wait until the relevant *Tit-Bits* was delivered from the Tower, and lo and behold, the solution to the puzzle was in my hands!

Peter Caspar
(*Trinity 1958*)

Letters

Geoffrey Willett supplied Geography undergraduates not only with the occasional humbug (CAM 84) but also sage advice on the relevance and whereabouts of books and journals needed when

facing difficult assignments or imminent essay deadlines! Thanks, Geoff.

Tim Cattell
(*Downing 1959*)

Don’s diary

Dr Andrew Grant says he hopes to keep all of the plates spinning and that none wobble – or if they do, that he’ll catch them before they break. My sentiments exactly! But equally applicable to the lives of most professional musicians.

Stephanie Muncey Dyer
(*King’s 2006*)

In praise of porters

To this day, I fondly recall King’s porter Wilfred Childerley’s cheery and spiritually uplifting: “Good luck, Sir!” as I walked through the lodge in a terrified state on my way to Tripos exams.

Wilfred’s warm and friendly greeting became such an essential support that, on the one occasion he failed to appear, I actually walked back to pass through the Porters’ Lodge a second time in order to receive Wilfred’s indispensable boost to my confidence.

Trevor Lyttleton
(*King’s 1954*)

Ten years after graduation, I was moved to devote the first thanks in the acknowledgments page of my book “to Mr Iredale and Mr Wilfred Childerley, who welcomed me back to work at King’s”. They were, of course, the embodiment of entrance to, and

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benevolent existence at, the College – its porters.

Mallory Wober
(*King’s 1954*)

Downing in, ahem, pink

The *My Room, Your Room* feature is often the first article that I read and, as the latest issue featured Downing, I was more than usually interested.

However, the reference to a black and pink boat club blazer did rock me back on my heels – black and magenta, please! But the article also prompted a memory: attending a Downing reunion earlier this year, I went to renew acquaintance with room T3, T Staircase, where I had spent my first year. Sadly, the board listing current occupants did not include T3. Further investigation revealed that my room is now the communal bathroom. I suppose that is progress!

Terry Oddy
(*Downing 1958*)

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IN NUMBERS

100

The first Festival of Nine Lessons and Carols was held in 1918 – one hundred years ago – with the aim of bringing a more imaginative approach to worship. It is now broadcast from King’s every Christmas Eve to millions across the globe.



VICE-CHANCELLOR’S 1 OCTOBER ADDRESS

A force for knowledge

Broadening access must be a priority if the University is to maintain its exceptional record of achievement, the Vice-Chancellor has said. In his annual address to the Senate House, Professor Stephen J Toope (Trinity 1983) expressed his wish for Cambridge to remain “an unstoppable, unapologetic force for knowledge and understanding, for more inclusive communities and for the betterment of our shared world”.

Speaking on 1 October, he said: “We cannot truly thrive as a university if we are not open to the social and cultural diversity of the world around us. Continued and expanded excellence requires that we build on existing research initiatives, foster new areas of strength and address new research questions.”

In announcing a £500m fundraising campaign for student support, the Vice-

Chancellor said: “I want us to be genuinely open to all who have the talent to flourish at Cambridge. The challenge is considerable – but so is the scale of our ambition.

“I am pleased to announce that we are undertaking cross-University efforts to achieve a step-change in widening participation. A comprehensive student support initiative will encompass a range of schemes including postgraduate studentships, support for undergraduates and the development of a comprehensive student wellbeing campaign.

“The initiative will help Cambridge improve its research performance and carry out its core mission.”

To read the Vice-Chancellor’s address in full, or to watch his video message for alumni, visit: alumni.cam.ac.uk/go/V-C-message.

FIELDS MEDAL WINNER

A University mathematician who came to England as a Kurdish refugee has been named one of four recipients of a 2018 Fields Medal, the most prestigious award in mathematics. Professor Caucher Birkar won for his work on categorising different kinds of polynomial equations. Accepting his award at the International Congress of Mathematicians in Rio de Janeiro, Birkar said: "War-ridden Kurdistan was an unlikely place for a kid to develop an interest in mathematics. I'm hoping that this news will put a smile on the faces of those 40 million people."

PHILANTHROPY

Stormzy unveils scholarships

Acclaimed grime artist Stormzy has announced a new Cambridge studentship scheme for four black British students.

The Stormzy Scholarship will cover the full cost of tuition fees and provide a maintenance grant for up to four years on any course. Stormzy will personally fund this year's entries, but hopes to engage support from additional investors as the scheme continues.

Stormzy said: "I hope this scholarship serves as a small reminder that if young black students wish to study at one of the best universities in the world, then the opportunity is yours for the taking – and if funding is one of the barriers, then we can work towards breaking that barrier down."

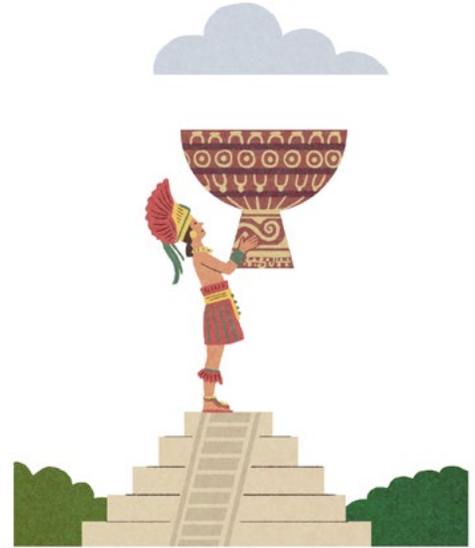
In 2017, the University admitted 58 black students on to undergraduate courses – this number represents a third of all black

students admitted to higher education in the UK that year, who attained at least A*A*A at A Level (the average grade achieved by a Cambridge entrant). However, the University is committed to doing more to encourage young black students to apply. Stormzy's support, the University believes, can help inspire new generations.

The Vice-Chancellor, Professor Stephen Toope, said: "We know we need to work harder to ensure that black students not only apply, but that they feel at home and achieve their full potential. Stormzy is an inspiration, not just for his music, but for his engagement on social issues and encouragement of young people. The scholarships are a beacon for black students who might otherwise have felt they could not come to Cambridge." alumni.cam.ac.uk/go/stormzy



ILLUSTRATION: MICHAEL KIRKHAM; PHOTOGRAPHY: NICK SAFFELL



TWO-MINUTE TRIPOS

SUBJECT RESEARCHERS THINK DROUGHT MIGHT HAVE CAUSED THE MAYAN COLLAPSE. DISCUSS.

Isn't it great to live in the modern world where human ingenuity will save us from climate change?

Well, that's a nice idea. But some of the world's most advanced societies have collapsed because of environmental change. Take the Mayans – they abandoned their cities, their dynasties fell and they became an irrelevance.

Yep, I'd certainly agree that she's having problems coping right now. Not that May. I'm talking about the highly developed Mesoamerican civilisation which inexplicably came to an end around a thousand years ago. I assume that human ingenuity has found out why?

Well, yes, I'll give you that one. Cambridge researchers wanted to see if drought had played a part. They found a way to measure the different isotopes of water trapped in gypsum, a mineral that forms during times of drought when the water level is lowered, in Lake Chichancanab in Mexico's Yucatán Peninsula.

And they found what with their modern isotope measuring?

Drought. A serious one. Precipitation decreased between 41 per cent and 54 per cent.

Oh. So the Mayans didn't work out a clever way to get round the drought. No.

And that's the cause? Not something else that wouldn't affect us today?

Well, the paper's first author, Nick Evans, a PhD student in Earth Sciences, says that although the role of climate change is "somewhat controversial", the study represents a substantial advance, as it provides statistically robust estimates.

Well, whatever. That was a thousand years ago, right? We're far more intelligent and advanced now.

Of course. Absolutely. No question. I'm sure we'll all be fine.

Hot in here today, isn't it?



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A cache of new material reveals political subversion

Dr Stanley Bill is a University Senior Lecturer in Polish Studies in the Faculty of Modern and Medieval Languages and a Fellow of Sidney Sussex.



The end of the academic year always carries a special atmosphere of tension and expectation. As the exam season approaches, the Colleges regain some of their former monastic solemnity, closing their gates to outsiders. Students spend long hours in libraries and study rooms, poring over readings, notes and essays from throughout the year. Lecturers and supervisors focus on channelling anxieties into constructive revision work. My aim is to ensure that all my students have the opportunity to show their full potential in the exam room. Yet the final reckoning is always between the individual student and an empty answer booklet.

While teaching is the main priority during term time, research and writing are always on the agenda. I spent much of Easter Term putting the finishing touches to a new paper about Bruno Schulz, a Polish-Jewish artist and writer who is widely regarded as one of the most important and influential figures of 20th-century Polish culture. Schulz would be awarded the Polish Academy's Golden Laurel in 1938; four years later, in 1942, he was shot dead on the street by a German SS officer.

During the second world war, Schulz's hometown of Drohobycz – then in eastern Poland – was first occupied by the Red Army. In conditions of terror and deprivation, in 1940 and 1941, Schulz worked as an illustrator for a local propaganda newspaper entitled *Bolshevik Truth*. In 2016, the illustrations – many of them glorifying Stalin, Lenin and Soviet military power – finally emerged from archives in Ukraine.

The materials are fascinating. Far from being a communist, my research shows that his propaganda work formed part of a survival strategy of artistic and ideological mimicry. I have even found evidence to suggest that Schulz cleverly concealed politically subversive material in his illustrations, revealing his authentic views on Soviet ideology and the occupation of eastern Poland. His work – which might be described as a form of forced labour – exemplifies the

“With Brexit approaching, and around a million Poles living here, intercultural understanding has rarely seemed more important”

dramatic choices faced by individuals under the Soviet occupation.

Scholarly research is an empty pursuit without the possibility of sharing and discussing it with other experts and a broader public. While I was getting my paper ready for publication, I had the pleasure of presenting some of it at the biannual International Festival of Bruno Schulz in Drohobycz, now in western Ukraine. The festival hosts scholars, writers, artists and often eccentric Schulz fanatics from around the world. As part of the programme, it was a privilege to participate in a public discussion in the town's newly restored synagogue, an imposing building that had lain in ruins for more than half a century after the war.

Back in Cambridge, my research work informs the new programme in Polish Studies that I direct in the Faculty of Modern and Medieval Languages. My course offers an introduction to the diverse history of Polish culture, from its symbolic beginnings more than a thousand years ago through to the traumatic period of Schulz's life and death in the 20th century and beyond. The course gives students a deeper understanding of the largest country in the eastern part of the European Union, along with the opportunity to learn a language that is now the second most widely spoken in Britain.

Apart from the historical dimension, I place a particular emphasis on contemporary Poland and on cultural exchange. A special partnership with the University of Warsaw allows us to award full scholarships to Cambridge students to attend summer school courses in Polish language and culture in the country's vibrant capital.

Which means that after exams, our students get to spread their wings and get a first-hand look at a culture that is now also part of the tapestry of British life. With Brexit approaching and around a million Poles currently living in the United Kingdom, intercultural contact and understanding have rarely seemed more important.



C2 Old Court, Peterhouse

Ed Smith (Peterhouse 1995) and fourth-year natural scientist *Lauren Baldwin* discuss sport, life – and the surprising uses to which cabinets may be put.

“
The cupboard
where Smith and
Ashforth kept their
toaster is now
a drinks cabinet,
containing some
rather good whisky
”



Room C2 is steeped in history. Its sitting room walls are covered in 18th-century panelling; the graffiti scratched into the stone windows is even older. It is a place for scholarship. For reflection. And, as Ed Smith recalls, for rugby practice.

“I shared C2 with Rob Ashforth, who was the Blues fly-half,” he remembers. “And the rugby ball was just ... around. We’d throw it to each other all day, despite the panelling. I’m fairly sure a few things got broken ...”

Today’s occupant, fourth-year natural scientist Lauren Baldwin, is without a rugby ball but has made some innovations of her own. The cupboard where Smith and Ashforth kept their toaster is now a drinks

cabinet, containing (as Smith notes) rather good whisky. “It was terrific fun when I moved in, wandering around and opening up all the little doors,” Baldwin says. “I’d always wanted this room so I was thrilled to get it.”

For Smith, the room provided welcome refuge from an often packed schedule. After a morning at the history library, Smith’s afternoons were spent reading – or, for his Wagner paper, listening to music. “I worked out that this was a good way to pretend I was working. So I’d listen to the end of the Ring Cycle. And Rob would say: ‘Put on that one that sounds like *Star Wars* again.’ So on the one hand we had this high-culture thing. And then he’d fling the rugby ball ...”

But while rugby may have played an important role in the life of C2, Smith is first and foremost a cricketer (indeed, he scored a hundred on his first class debut for the Light Blues against Glamorgan in 1996).

“Cricket was a focus of course,” he says. “But the structure of life at Peterhouse – great friends, an intellectual life, a sporting life – suited me. When I went on to play professionally, it unbalanced me. It wasn’t until my mid-20s, when I started writing books, that I started to get that balance back.”

Being at a small college helped, he says. “Peterhouse was always a jumble: we didn’t have silos of particular types of people. There was a lovely mix in our group, which suited

IN BRIEF

ALUMNI EVENTS

Join fellow alumni and friends at events around the world. More than 40 seasonal gatherings, organised by Alumni Groups, will take place during December and January; next year, alumni will be warmly invited to join the University at Global Cambridge events. Finally, we hope as many of you as possible will join us on the river or at viewing events all over the world, to cheer on the Light Blues in the annual The Boat Race on 7 April 2019.

alumni.cam.ac.uk/events

APPOINTMENTS

Professor Madeleine Atkins CBE has been elected Lucy Cavendish College's ninth President. Professor Atkins was previously Chief Executive of the Higher Education Funding Council for England (HEFCE). Alan Bookbinder, a former BBC journalist and previously director of the Sainsbury Family Charitable Trusts, was installed as Master at Downing on 1 October.

NEW DOCTORAL FUNDING

The University – in partnership with Oxford and The Open University – has won funding for almost 400 new doctoral places in the arts and humanities. The new Open-Oxford-Cambridge Arts and Humanities Research Council Doctoral Training Partnership will offer students a wealth of opportunities to pursue research and engage in training, and to learn from each other as part of a large multidisciplinary group.

NOBEL PRIZE

Master of Trinity, Sir Greg Winter, has been jointly awarded the 2018 Nobel Prize in Chemistry, along with Frances Arnold and George Smith, for his work in using phage display for the directed evolution of antibodies. In total, 107 affiliates of the University have been awarded the Nobel Prize since 1904.



ALUMNI GIFTS

Christmas treats for Cantabs

This Christmas, give the Cantab in your life a gift that they can tote with pride – and nostalgia. Our new alumni range includes Light Blue satchels, notebooks and luggage tags from the Cambridge Satchel Company, and new additions such as the skinny tie produced by Ryder and Amies, and blazer buttons and badges by new partner Benson and Clegg.

To explore the full range of gifts, visit alumni.cam.ac.uk/shop.



My Room, Your Room timemachine: William Eden (Peterhouse 1698) also left his mark on C2.

me really well.” Baldwin agrees. “When you’re doing a large subject, it’s great to have a smaller place to go back to, where there are people you recognise and say hello to, even if you don’t know who they are.”

Sport is important to her too, she says. “I’m a cox. It gets you out of your room, and you’re part of a community. Though I admit that I only went along to start with because they were having a barbecue.” (The finding of free food, they conclude, is an essential life skill.)

Baldwin is undecided about her future: “I’m keeping an open mind. Sometimes, if you don’t have something definite, it’s good to just wait and see what comes up.” Smith agrees. “Don’t plan, adapt,” he says. “That’s not my advice to you, because you’re going to be amazing. But you can plan too much. You never know exactly what you’ll love.”

Ed Smith is chief selector for the England cricket team. He is an author, journalist and ex-professional cricketer. He is co-founder of the Institute of Sports Humanities – sportshumanities.org.

Lauren Baldwin always brings her LPs up with her. However, as plug points are at a premium in C2, she is currently researching the best place to site her turntable.



A Genius Gift!

AQUILA Magazine is perfect for Christmas; its mind-stretching articles can be read and enjoyed by the whole family.

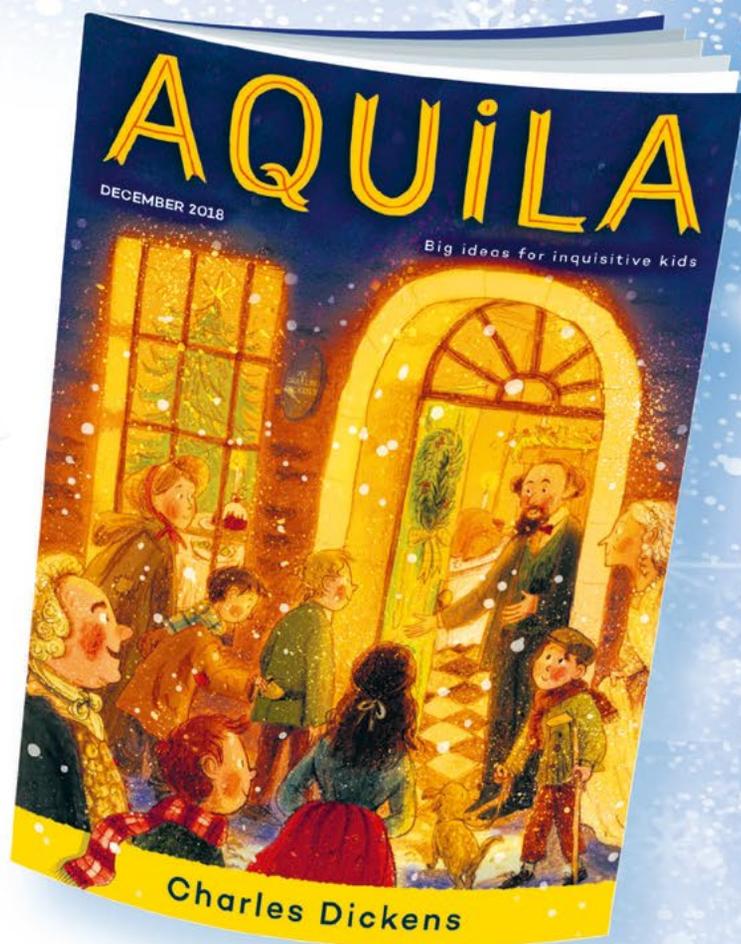


From **Supervolcanoes** to **Leonardo da Vinci**, this advanced and philosophical publication introduces young readers to a thought-provoking mix of **Science, Arts and General Knowledge**.

AQUILA is not like any magazine you will find on the newsstand; it is more like a special club for **inquisitive kids** – they will soon discover a community of other thoughtful youngsters just like themselves – **creative** and **curious**. Throughout the whole year children will enjoy a great line-up of topics, with puzzles, **fun experiments** and **things to make**.

The December issue of **AQUILA** was produced in collaboration with the **Dickens Museum, London**.

- ✓ **BIG IDEAS** for 8–12 year-olds
- ✓ **Challenging Reading & Puzzles**
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AQUILA's December issue is a Dickensian extravaganza! Includes a hilarious 'Penny Dreadful' Christmas supplement, plus **AQUILA's** Mammoth Wall Map & Passport Puzzle booklet for all new subscribers.

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FUN
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online

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Below, clockwise from top left: Manraj Dhanda (Queens'), Roshan Ruprai (Corpus), Sara Poursafar (Newnham), Nadia Priebe (Queens').

Too legit to quit

Cambridge University Hip Hop Society is spreading the love with good vibes – and great music.



Two years ago, the Hip Hop Society was an inactive Facebook page. Today it's a staple of the University's social scene, says president and third-year engineer Manraj Dhanda (Queens'). "When people say it's been the best night they've had in their three years at Cambridge, it's an amazing feeling!" he says.

In fact, according to Dhanda, the society's success is built on the efforts of past president – "and Hip Hop Soc godmother" – Rabeka Zafar, now in her fourth year at Trinity.

"Rabeka described the society as a social space for fans of hip hop, grime, R&B and related genres, and that is still true," Dhanda says. Indeed, for those who want to get up in front of a crowd, the society holds exhibition nights, where anyone can perform whatever they like – which was how Dhanda got involved.



"Rabeka had seen the bars [rap lyrics] I posted on a competition on Facebook, so she messaged me asking if I'd like to perform," he remembers. "When it was my turn to take the mic I was shaking a bit, but when I spat my first verse, it got such a good reception from the crowd that I grabbed the mic off the stand for the rest of my performance and had an absolute blast.

"The noise of the crowd and the joy on their faces when I looked up triggered such a euphoric feeling. I can still feel it now. Before that session had ended, I'd already decided I would run for president!"

Today, the society introduces newbies to the form and is a welcoming space for other genres and art forms, too. It puts on 'Jazz x Hip Hop' nights, encouraging people to rap, sing, dance, tell short stories or perform poetry with jazz band Syzygy. Radio is another way to reach members, with live links

posted on the Facebook page for people to listen in and send messages or music requests.

And for the past two years, the Hip Hop Society have attended Formal Hall en masse. "This year," says Dhanda, "about 50 of us went to Robinson, and had a great time over dinner and socialising in the bar afterwards."

He says being involved in the society has been a hugely positive experience, both in terms of his own performance skills and working with others. And with more than 200 mailing list sign-ups at Freshers' Fair this year, Dhanda's hoping that the love will spread even further.

[facebook.com/CUHipHopSoc](https://www.facebook.com/CUHipHopSoc)



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Photo: The Tallis Scholars in St John the Baptist, Burford, 'Music in the Cotswolds' 2018, ©Bill Knight.

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How effective is your donation? Research can help find the answers

Professor Pauline Rose is Director of the Research for Equitable Access and Learning (REAL) Centre in the Faculty of Education.

Half of all children in Africa are excluded from education as a result of gender, poverty or disability. Many of us willingly give to local charitable programmes designed to improve access to education, especially for young girls from disadvantaged backgrounds, yet I was shocked to discover how few studies have measured how cost-effective these programmes are – making it impossible to know if this has been money well spent.

At the Research for Equitable Access and Learning (REAL) Centre, we are working with the non-profit organisation Campaign for Female Education (Camfed) in Tanzania, which has among the lowest rates of secondary school enrolment in Africa. Over the past decade, the charity has helped more than 140,000 Tanzanian children, of whom around 65,000 are girls, into secondary education through a bursary programme covering the direct costs of schooling, such as tuition fees, uniforms, textbooks and expenses in travelling to school (which may include the cost of boarding).

Financial support is given exclusively on the basis of need, rather than academic potential or performance, and Camfed works with the local community to identify those marginalised girls most at risk of dropping out of secondary education.

An evaluation of the programme identified it was a success in terms of improving learning, but they needed to know how cost-effective it was. We know it costs more to reach the most marginalised girls in society, but most analysis to date has not disaggregated the data to identify the effects of support on the most disadvantaged. We wanted to measure the results taking into account equity considerations: improved access combined with improved learning.

Both sides went into the research with a degree of nervousness – we had no idea what we would find, and the charity had to agree that we would publish our findings, whatever the result. Nor was the work easy, as we had

“**Funders want to know that their money is being used wisely – evidence-based research can only help the charitable cause**”

to use their raw accounting information. We linked this cost data to the information on the beneficiaries they support, including both enrolment and learning outcomes.

We found that, for all children supported by the charity, the programme’s impact is equivalent to an extra 1.7 years of schooling for every \$100 spent. When we focused on the benefits of increasing both access

to schooling and learning for the most marginalised girls through the provision of bursaries, that figure increased to an additional two years of schooling for every \$100. The effect is sustainable – cost-effectiveness improves by a third, and in terms of scalability and ability to replicate it, it improves by 43 per cent.

Not only are the recipients of bursaries more likely to stay in school, they are doing well. It may seem obvious, but it is not that poorer children can’t learn – rather that circumstances are stacked against them. The charity offers a holistic approach to learning, with a life-skills programme to promote self-confidence and learning delivered by young women previously supported by the charity. We found that pupils in Camfed-supported schools on average tripled their assessment scores.

The charity is using these positive findings not just to promote their own schools’ programmes, but as advocacy for others to adopt similar approaches. Our work shows that analysis of this type ought to be possible with other NGOs, but for it to be feasible, NGOs need to collect their spending data in a more organised manner, be willing to release all their cost information – and be prepared to accept the findings. At REAL, we are now in discussion with a number of NGOs to see whether we can carry out similar cost-effectiveness research; the Department for International Development is also keen to learn from our approach.

Funders want to know that their money is being used wisely. Our analysis shows that, in the case of the Camfed programme in Tanzania, properly directed financial support, given to those most in need, has measurable, positive results. In my opinion, this evidence-based research can only help the charitable cause and therefore enable more marginalised girls to stay in school. And this, we know beyond doubt, is at the heart of social and economic transformation. www.educ.cam.ac.uk/centres/real

On charisma

Whether wielded by rock stars or politicians, charisma is the ultimate soft power. CAM explores the dark side of this most alluring – and potent – of qualities.

WORDS CATHERINE GALLOWAY ILLUSTRATION CHESTER HOLME



“I don’t want to be rude but, really, you have the charisma of a damp rag and the appearance of a low-grade bank clerk. And the question I want to ask is: who are you? I’d never heard of you, nobody in Europe had ever heard of you.”

History does not record whether the brand-new president of the European Council, Herman Van Rompuy, went home and wept into his pillow after this zinger from British MEP, and leader of the UK Independence Party, Nigel Farage. It was February 2010 and with an escalating sovereign debt crisis to deal with, Van Rompuy presumably had little time to dwell on the rudeness from the floor. Farage was fined €3,000 and that was the end of it. Or was it?

Farage, however unwittingly, had put his finger on something important. Europe, and indeed the world, was entering an ‘age of anxiety’. And anxious times call for charismatic leadership. Damp rags might be good at cleaning up the mess, but they aren’t hot on hope or transformation.

Six years later, Farage was back. Alongside other unorthodox but expert popular communicators like Boris Johnson, then Mayor of London, Farage had helped to persuade almost 52 per cent of the British public that permanently leaving the European Union was a good idea.

With Brexit in the bag, Farage was triumphant, while Jean-Claude Juncker, president of the European Commission, was incredulous. “You lied,” he told Farage. “You didn’t tell the truth. You fabricated reality. I regret that this is the last time we will debate with each other – because you won’t be coming back.” He was right. By August, Farage >

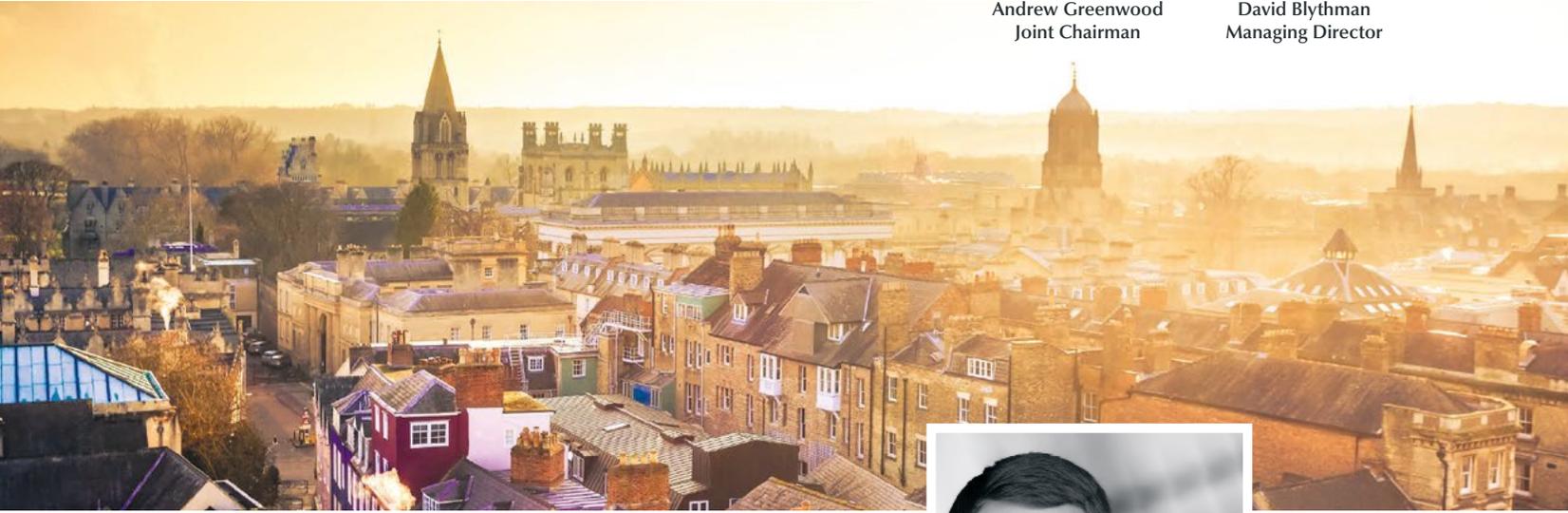




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Mr OM, Japan

A close encounter with weapons-grade charisma is notoriously difficult to describe or process afterwards. But, if you are determined not to drink the Kool-Aid, how do you resist it?

was in Jackson, Mississippi, on the campaign trail with a fellow charismatic political outlier – President Trump.

Exactly 75 years before Trump and Farage, another American president, Franklin D Roosevelt, burst into a bathroom at the White House shouting “United Nations!” His surprised guest, a certain Winston Churchill, clutched his towel a little closer and agreed that the idea sounded promising. Days after Pearl Harbour, the famously charismatic FDR was planning for peace before America had even entered the war.

Charisma, for good or ill, gets things done. But how does it work? And why? And when? Dr Sander van der Linden is Assistant Professor in Social Psychology and Director of the Cambridge Social Decision-Making Laboratory. He agrees that charisma is elusive but notes there are certain factors that charismatic people, from Gandhi to Oprah, all share: “Attractiveness; temperament; voice; eye contact; they use verbal and non-verbal communication very well; and of course they have a vision and communicate it powerfully – think of Martin Luther King’s ‘I Have a Dream’ speech.”

Charisma versus complexity

So far, so inspiring, but Dr Van der Linden confirms that, given an opportunity for real power, personal magnetism has a flip side. “Charismatic leaders become much more prominent in times of social crisis and social change because they present simple solutions to very complex problems,” he says. “We naturally drift towards resolving a state of anxiety because it is uncomfortable, so heightened receptiveness to a charismatic person is not unusual, and we become open to ideas that we might not otherwise be open to. In addition, being anxious eats up brain space, so we are less likely to think carefully and rationally arguments.”

A close encounter with weapons-grade charisma is notoriously difficult to describe or process afterwards. It seems you really did have to be there. But, if you are determined not to drink the Kool-Aid, how do you resist it?

“Basically, the whole process needs to be interrupted,” Dr Van der Linden says. “The brain needs to be specifically prompted to become more analytical. For example, before going into a business meeting with a very charismatic, powerful boss, you could make pre-commitments with others who will be at the meeting to challenge them. If one person speaks up, others will follow. But there has to be that first disruption to the narrative.”

The ‘narrative’ of charisma as we know it today was set out a century ago by German sociologist Max Weber. Sitting in Heidelberg on the eve of the first world war, and feeling let down by the Kaiser whom he called “a dilettante”, Weber was wondering about power – what it should look like and who should wield it. We still need the rational structures of political life, like laws and bureaucracy, Weber reasoned, and there may be a place for the traditional hereditary power of monarchs. But there was a gap, an opportunity, for a different

kind of leader; someone, he thought, “set apart from ordinary men and treated as endowed with supernatural, superhuman or at least specifically exceptional powers or qualities”.

Duncan Kelly, Professor of Political Thought and Intellectual History in the Department of Politics and International Studies, explains: “For Weber, charismatic authority is about control and he doesn’t believe you can be successful in politics without it. Is this power ethical? Weber isn’t sure. Charismatic leaders tend not to come through the usual channels, almost as if it’s a politics of the extraordinary rather than normal procedure. Where Weber is interesting is that he recognises that you need both types in politics, but also that both are problematic.”

Weber died in Munich in June 1920 and couldn’t yet see the kind of leader he was thinking about, although four months earlier, in the same city, Adolf Hitler had announced the programme of the Nazi party at its first public meeting. Charismatic authority was up and running, right past Weber’s window.

Twenty-five years later it was all over. Professor Kelly believes that’s why reading and learning from Weber today is still vital. “He offers a road map for possible success in politics where charisma plays a leading role, but it comes with a plausible structural explanation as to why it is that almost all political careers, charismatic or otherwise, nevertheless end in failure,” he says.

So what would Weber make of his Germany today, with the enduring, and determinedly uncharismatic, leadership of Angela Merkel? Professor Kelly smiles. “I think she represents what we could call ‘charismatic efficiency,’” he says. “She meets Weber’s requirements of the sober, responsible and independent-minded politician who can manage and deliver hard choices. But I think her charisma came through most strongly with her instinctive response to the migration crisis. There she reasoned with her heart, as an East German who moved to the West, and with the weight of the whole of modern German history to deal with. Of course, it has now cost her politically, but there we really see her trying to balance Weber’s two poles: the ethics of conviction and the ethics of responsibility.”

On easy street?

American novelist Henry James was Weber’s contemporary, but Weber’s work was not translated into English until 1930. So, as Emeritus Professor of English Literature Adrian Poole explains: “James could not have known or used the term ‘charisma’, but he was very interested in what he called ‘charm’ and how it worked in public and private life. He recognised the kind of super- or hyper-charm that the emergent modern world would require. *The Golden Bowl*, in particular, is a brilliant analysis of what it is to charm and be charmed, and to lead a charmed life.”

Like Weber, James is ambivalent about the power of charisma and is careful to show his readers all sides ›

of the story. As Poole notes, “Gilbert Osmond in *The Portrait of a Lady* is charismatic for Isabel but not for everyone. He ‘captures’ her, whereas Lord Warburton simply ‘charms’ her. She marries Osmond willingly, but eventually she recognises this has been a calamitous mistake. Reading Henry James is good for you because the power of a charismatic individual never goes unchallenged.”

Meanwhile, in the ‘real’ world of 1901, James was watching a young Teddy Roosevelt, a man he felt to be “a dangerous and ominous Jingo”, become the first ‘modern’ American president. One who really understood the power of charisma and how to harness it.

Professor Poole, who delivered the University’s annual Graham Storey Lecture on ‘Henry James and Charisma’, says: “The sheer speed at which we live now means that the fortune, or fate, of words has speeded up. Words that seemed simple a week or a year ago suddenly seem coloured. We need good novels to make us slow down, to make us think about how certain forces are always at work, in ourselves and in others. At the very least they may make us think twice before marrying Osmond – or voting for the wrong Roosevelt.”

Reflection as a form of resistance. Putting distance between ourselves and the white heat of personality.



Making sure it works for us and not just on us. Psychology, politics and literature are clear that when it comes to charisma we need to proceed with caution.

But charisma can also be a force for good. It can make things happen. And perhaps most importantly, it turns out that, in the end, charisma is not in your genes or your stars. Charisma can be learned.

A programme for charisma

And if it can be learned, can it even be ... programmed? Dr Hatice Gunes, Associate Professor at the Department of Computer Science and Technology, is investigating "adaptive robotic emotional intelligence for wellbeing" as part of her new £1m EPSRC (Engineering and Physical Sciences Research Council) project.

Her field is a multidisciplinary one, overlapping with social sciences and psychology as much as robotics and machine learning. This means that the broad brushstrokes of the charismatic personality – extroversion, openness and conscientiousness – are the same for a real person or a clever piece of circuitry. "We know that in human-robot interaction, personality matters a lot for engaging people and creating believable interactions," Gunes says. "If people engage more,

everything they do with that robot will be more effective. You could even adjust the extroversion level of the robot depending on the person they are interacting with."

But before we get carried away into an apocalyptic future where we're in thrall to machines (although parents of teenagers may argue we are already there), Gunes is careful to reset the argument. "The question is not so much 'Can we create a charismatic robot?' but more 'In what circumstances would humans need one?'" she says. "For example, in the field of neuropsychology, autism is a very hot topic right now. Autistic children can have trouble interpreting facial expressions, but if they interact with child-like robots programmed initially to have quite limited, mechanical facial expressions they can gradually learn to understand emotional, non-verbal communication."

And even here charisma starts and ends with us. "Robotics researchers envisage assistive technology that is designed to understand humans better, to help us develop," says Gunes. "The idea is that we can co-evolve with technology rather than be replaced by it." Charisma, then, can move mountains or lead us over a cliff edge. But it has no power at all until we decide to 'buy it'. The damp rags might just stand a chance. ☺



Ima-
chine
learn-
ing!

Artificial intelligence. Deep learning. Neural networks. Think you can ignore this stuff? Think again. Because machine learning is far too important to be left to the ComScis.

WORDS SARAH WOODWARD GRAPHICS ROB FLANAGAN



early six decades have passed since Arthur Samuel, a researcher at IBM, began programming computers to play draughts.

He went on to create a program that could challenge a respectable amateur. Last year, DeepMind, founded by Demis Hassabis (Queens' 1994), unveiled AlphaZero – a computer program that had 'taught' itself to play chess from scratch in just four hours, with no initial input of human knowledge. AlphaZero went on to beat the recognised leading chess program Stockfish – by sacrificing a bishop in an apparently reckless move. The machine was learning to do the unexpected, by itself.

Machine learning would be impossible without the astonishing increase in computational power (an estimated 1 trillionfold increase in performance over 60 years) which has enabled computers to examine big – often massive – datasets. This 'big data', whether of heart scans or Amazon purchasing records, provides the source material from which the program learns.

Professor of Computational Biology Pietro Lio' is using big data and machine learning to provide clinicians with better information by combining data of different types – medical imagery (MRI scans, x-rays), electronic health records (blood and glucose tests) and audiovisual data – and from different sources, such as (for their current work with cancer patients) radiology, epidemiology and inflammolgy. "The tools biologists use to put together theory and application in medicine need to be made easier for physicians to access, and machine learning enables the transfer of learning across disciplines. By creating communities and bridging data gaps, we can receive new data to build back into our theories."

However, Lio's warns that data alone is not enough. As he says, "there is a widespread belief that you can do hypothesis-free research because, having enough data,

machine learning will provide the answers in a semi-automatic way". For a system to be intelligent, it must be able to learn from experience: to process information and perform tasks by considering examples without having been given any task-specific rules. This is where virtual neural networks come in, taking the principles of maths as their blueprint.

At the base of the architecture of a machine learning system are the 'neurons': mathematical functions containing 'weights' and 'biases'. Weights are the numbers the neural network learns in order to generalise a problem. Biases are the numbers the network concludes it should add after multiplying the weights with the data. When neurons receive data, they perform computations and then apply the weights and biases. Usually, these are initially wrong, but the network then trains itself to learn the optimal biases, gaining complexity.

However, while the earliest systems had just two layers – input and output – most current systems have more layers and so the network is referred to as 'deep'. And as deep learning effectively takes place in a multi-layered black box, where algorithms evolve and self-learn, scientists often do not know how the system arrives at its results. So, while virtual neural networks have been around for a long time, combine them with deep learning and you get a game-changer that can still baffle scientists.

In fact, deep learning systems can confidently give wrong answers while providing limited insight into why they have come to particular decisions. As Dr Richard Turner, Reader in Machine Learning in the Department of Engineering, explains: "Machine learning methods use hierarchical [knowledge] representations and in conventional machine learning, most approaches are super-confident. Traditionally, the data is fed-forward. The issue today is to develop algorithms that represent ›

Deep learning takes place in a multi-layered black box, where algorithms evolve and self-learn. That means scientists often do not know how the system has arrived at its conclusions

Deep learning in action

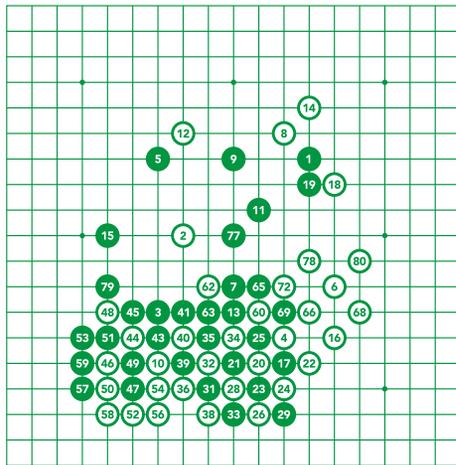
What actually happens when a machine learns? AlphaGo Zero has been created to play the famously complex strategy game, Go. Previous versions of AlphaGo initially trained on (ie were fed data about) thousands of human amateur and professional games to learn how to play the game. Incredibly, AlphaGo Zero skips this step and learns to play simply by playing games against itself, starting from completely random play.

3 HOURS

Beginner

ELO RATING: ~1800

AlphaGo Zero plays much like a human beginner, with no long-term strategy, focusing greedily on capturing stones.



uncertainty, so that the machine will not only recognise and flag up when it makes a mistake, but actually learn from it”.

“Effectively, the system will train itself from the data it receives, including from other data sources, reducing the probability of making a mistake in the future.”

This is important in Turner’s work on climate science, where he and his team are working with well-calibrated uncertainty. He says: “At the moment, we definitely can’t predict the weather but, over time, the system can test whether, for example, its prediction of how many days will be over 27°C was correct and what it should then infer from that information.”

Turner points out that any system operating in the real world needs to learn to adapt rather than remain static. Take the classification of self-driving cars; every year there will be new models, with new performance parameters. When new tasks are added, deep neural networks are prone to what is known as ‘catastrophically forgetting’ previous tasks. So, Turner and his colleagues are working to build networks that are capable of assimilating new information incrementally. For the system to be effective, it must undergo continuous layered learning – as circumstances change, the algorithms constantly update – just as children learn by experience.

And then there is the problem of language. “For most applications, artificial intelligence has to be able to access human knowledge, and of the whole range of cognitive

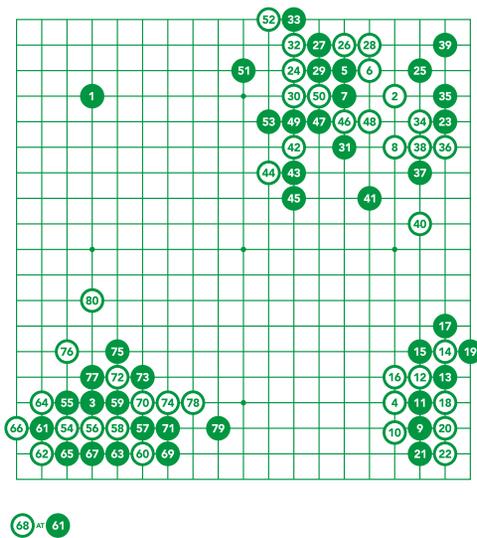
abilities, language is probably the most important,” says Ann Copestake, Professor of Computational Linguistics and Head of the Computer Science and Technology Department. “If AI is intended to mimic human intelligence, then the ability for machines to understand and communicate language is vital. Yet, for many years, Natural Language Processing (NLP) and AI were largely separate subjects. Only now are we finding commonality.”

Copestake and her team are using techniques such as supervised learning to ‘teach’ the system how to answer visual questions. Until recently, “the only way to do this was to cheat – the system would identify a visual image because the experimenter had already placed a symbol that allows the system to ‘see’ that image”.

By scraping multiple images from the web to show to the system, researchers in companies and universities have been building a shared visual library. Deep learning enables a computer system to work out how to identify a cat – without any human input about cat features – after ‘seeing’ millions of random images. But then, as Copestake points out, “you do get a lot of images of cats on the internet, so perhaps it is not surprising that this was one of the first images a system learned to identify. Same goes for guitars, which are the most common musical instrument. In fact, one of the bizarre findings is that if you show the system the descriptive text, and not the image, they do quite well at answering questions about the image purely through frequent associations”.

70 HOURS
Professional
ELO RATING: 3000

AlphaGo Zero’s game is remarkably balanced, involving multiple battles and a complicated *ko* fight.



3 DAYS
World Champion
ELO RATING: 3800

AlphaGo Zero surpasses the level of AlphaGo Lee, the programme which beat world champion Lee Seedol in 2016.

21 DAYS
Grand Master
ELO RATING: 4800

AlphaGo Zero surpasses the level of AlphaGo Master, the programme which defeated world champion Kie Jie and 60 top professionals in 2017.

40 DAYS
Super-human
ELO RATING: 5100

AlphaGo Zero becomes the best Go player in the world. It does so entirely from self-play, without human intervention or historical data.

And that matters because human language is grounded in the world – it has some physical presence. “Whatever system you are building, you first have to model that world and then match it with language,” explains Copestake. “We have gone back to showing simple images such as coloured squares and triangles and we then ask the system quite complicated questions.”

Professor of Mobile Systems, Cecilia Mascolo, uses machine learning techniques to make sense of the data she and her team gather from mobile wearable systems, mostly phones at the moment, but poised to encompass everything from necklaces and headbands to implants into the body. “The sensors continuously collect data that is both temporal and spatial, allowing us to analyse stress and emotional signals, as well as location,” she says. “The data is gathered in the outside world, so it can be noisy. Through machine learning, we can strip out extraneous information and ensure the mobile device only sends out the data that is important for our scientific work in applications for measuring health. Given the unprecedented scalable effect, we can reach populations for continuous diagnostics and illness progression monitoring: for example, we are working alongside neurologists on the development techniques to diagnose Alzheimer’s disease.”

Traditionally, machine learning requires huge machines, but Mascolo’s team at the Centre for Mobile, Wearable Systems and Augmented Intelligence is seeking to use it on devices with limited memory and battery. As Mascolo explains: “It is, of course, much easier to use machine learning in the cloud, but our work is on locally gathered data. If we can get this to work, it will help break

down the barriers against acceptance of mobile health measuring because, by taking a local approach, individuals will feel more in control of their data.”

Indeed, ‘feeling in control of our data’ will be key to the future of machine learning. Today, the artificial intelligence we encounter is ‘narrow’ – designed to undertake a defined (narrow) task, whether that is voice and facial recognition or driving a car. However, the long-term aim for some scientists is super-intelligence: ‘general’ or ‘strong’ artificial intelligence – designed to perform all tasks as well as or better than humans.

But Richard Turner, for one, prefers to stay away from using the word ‘intelligence’. “It is very loaded. People talk about artificial intelligence for hype, particularly when they are raising money, but there is still nothing out there that can mimic true human intelligence,” he says. “Talk of singularity – the tipping point when artificial intelligence overtakes human thinking – is a distraction in my opinion. The field is split, but it is not clear to me that a general intelligence system is a sensible near-term scientific goal”

For Ann Copestake, responsible for the education of the scientists who will be the ones who decide what the future looks like, the issue is a live one. “We now teach machine learning to first-year undergraduates, rather than starting at PhD and Master’s level, because it is important to begin early with this fundamentally new way of programming,” she says. “But it remains an experimental, probability-based science, which must be approached in a controlled way, with proper methodology to produce effective results. After all, machine learning can create as well as detect fake news, and we need human intelligence to control it.” ©

DeepMind Chair of Machine Learning

A new DeepMind Chair of Machine Learning to be established at Cambridge will build on existing strengths in computer science and engineering, and be a focal point for the wide range of AI-related research which currently takes place across the University. The post is the result of a gift from DeepMind, the British AI company founded by Demis Hassabis (Queens’ 1994). The first DeepMind Chair is expected to take up their position in October 2019.

Today, AI
is narrow,
but the long
term aim
for some
is super
intelligence,
or strong AI



ROOT AND BRANCH



The economist-turned-geographer, Professor Bhaskar Vira, says that the natural world is good for us: economically, practically – and spiritually.

WORDS LUCY JOLIN PHOTOGRAPHY LYDIA GOLDBLATT

At boarding school on the edge of the Himalayas in the 1980s, Professor Bhaskar Vira simply had to look out of his window to witness environmental destruction: his view was dominated by a limestone quarry, scarring the forested hills. But he also witnessed what happens when people with a deep connection to the landscape fight back.

“Environmentalism was coming into public life for the first time,” he remembers. “A group of activists lobbied the supreme court to ban the mining, and they succeeded. They restored the hillside and, if you go there now, there are almost no scars left from the mining. I’m sure things like that had a subconscious influence on me.”

Fast forward 35 years and Vira’s work reaches across disciplinary boundaries: economics, geography, public policy, conservation and international development. Originally a “straight down the line economist” who studied at the University of Delhi and at Cambridge, today Vira is “a geographer who has never studied geography”, Professor of Political Economy, and Director of the University of Cambridge Conservation Research Institute.

At the heart of his thinking is the idea that our relationship with the natural world goes beyond the merely functional. Living in and around nature adds to our wellbeing, regardless of whether the nature we can see provides us with drinking water, or wood, or food. Recognising that relationship is vital, he says, when thinking about ways to fight poverty while protecting the environment at the same time.

Vira’s Part II dissertation sparked his interest in environmental economics: it was 1990, the Rio Summit was being planned, and the environment was suddenly on the agenda. “The question in my mind was whether the discipline I was specialising in, economics, could add value to these global discussions,” he says. “That brought an activism into my intellectual life.”

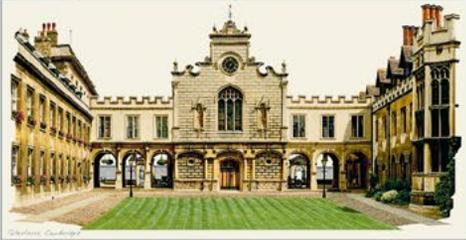
The result was a move to help set up the Oxford Centre for the Environment and Ethics in Society at Mansfield College, which exposed him to colleagues from other disciplines including law, sociology and anthropology. He came back to Cambridge as a lecturer in environment and development in the Department of Geography. “And that completed my transition from training in economics to professional life as a geographer.” Vira’s passion for interdisciplinary working was cited by the Royal Geographical Society, which awarded him the Busk Medal this year. “I define myself now as someone who is interested in political economy,” he says, “a subject that has a long tradition in Cambridge, and has historically embraced an inclusive interdisciplinary approach and a wide range of social science influences.” ›



Downing *The North Range*



Pembroke *Pembroke from Trumpington Street*



Peterhouse *Old Court*



St. Catharine's *View from Trumpington Street*



Clare *Entrance to Old Court*



Selwyn *Old Court*



Queens' *The Mathematical Bridge*



Trinity *Great Court*



Fitzwilliam *Fellow's Court and the Hall*

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| <i>Corpus Christi</i> | <i>Homerton</i> | <i>Peterhouse</i> | <i>Trinity</i> |
| <i>Darwin</i> | <i>Jesus</i> | <i>Queens'</i> | <i>Trinity Hall</i> |
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You might call it a spiritual or cultural dimension – so when we lose access to green spaces and impoverish the natural world, we are also impoverishing ourselves

And that's important, because early thinking about the environment and development generally ranged the two directly against each other. It's certainly true, says Vira, that conventional development is responsible for much environmental degradation. "This then sets up a very difficult challenge. How can countries that are very rich in environmental resources hold on to those resources, while also pursuing strategies that improve growth and the wellbeing of their population? If you perceive them as being opposed to each other, as one at the expense of another, it becomes very difficult to try and imagine a scenario in which both are looked after."

In the early 2000s, the concept of 'ecosystems services' came into play: the idea that nature provides vital services – such as drinking water – that allow humanity to flourish. In this model, instead of humanity's and nature's wellbeing being opposed, they're actually compatible. By investing in nature, we're investing in the wherewithal that allows humanity to lead better lives. Yet while drinking water is, of course, essential, there is another dimension to our relationship with nature, says Vira. It's not just about the tangible.

"You might call it a spiritual or cultural dimension, but there are other dimensions to our engagement with nature that directly constitute elements of what we call 'wellbeing,'" Vira points out. "In both philosophical literature and multiple different cultures, there is plenty of evidence that this resonates. It is not just that nature does things for us, but that it is fundamentally constitutive of our sense of self. We benefit from nature in ways that go beyond what it materially provides. So if that's true, when we lose access to green spaces and impoverish the natural world, we are also impoverishing ourselves. Can we find ways to capture that in the ways we talk about and measure things like poverty?"

In the 1990s, he points out, there was a lot of focus around dam building. In the developing world, when you build a dam, you often submerge a village, and the villagers have to be moved. They were often given new homes, food to eat and fixed-income packages – but nonetheless being removed from a place in which they and their families may have lived for generations created a real sense of rupture. "And that is true anywhere in the world: look at the people who will be displaced by the third runway at Heathrow," Vira says.

Which is one of the reasons he wants to help reshape the values by which we measure progress and wellbeing. Poverty measurement is now multidimensional: it takes in a whole range of factors including health and education. But the role nature plays in wellbeing is still not taken into account, and so consequently, nor are those aspects of poverty that emerge because of this deprivation.

"Nobody is asking questions about the loss of the natural in wellbeing surveys," Vira says. "It's not featured in people's ways of thinking about poverty. The consciousness is not there. We feel that our measures of poverty are incomplete, they miss something that really matters to our sense of self. If we are trying to understand what makes people better or worse off, our connections to nature should be part of that story." Reshaping these measures would make an impact at all levels: from the

hyper-localised understanding of what makes a place better, to global measures and understanding of poverty, growth and GDP that better reflect the value that nature provides. The first of the UN's 17 sustainable development goals is to end poverty in all its forms, everywhere. Within that goal, there are five targets, two of which are about the environment: to reduce vulnerability to climate-related events and to ensure that the poor and vulnerable have equal access to economic resources, including natural resources.

"The global community recognises that the environment plays a role in defining poverty," Vira says. "I think there is a clear mandate there for saying that nature's role in defining poverty should be reflected in our targets for poverty."

With that in mind, Vira is currently working on a project based in Brazil, one of the most data-rich countries in the world. The aim is to bring together data on poverty incidence and intensity, alongside data on health, education and living standards, and then map that on to available environmental data. He has also been working with colleagues in the UN on how this new approach might fit with the way the Rwandan and Malawi governments develop their poverty strategies. "They are very interested in thinking about how household-level questionnaires on poverty might better reflect some of our insights about the environment and those wellbeing indicators which are to do with nature."

But he's also excited about the possibility of small-scale interventions, such as a recent project in which he worked with local partners in six small towns in Nepal and India to raise awareness of how drinking water is extremely dependent on the immediate natural environment. It focused on the ecosystems that brought water to the towns, the pressures that threatened them, and the need for those who are planning water infrastructure to invest in the surrounding ecosystems. Afterwards, Vira and his team felt that the project should become part of the public narrative, so they worked with a photographer and mounted an exhibition, first at the Festival of Ideas in Cambridge, and then in Delhi.

"We had three big displays at the exit of one of Delhi's main metro stations, so it was effectively like coming out of Westminster tube and seeing our photos and our narrative every day for three months during the dry season," says Vira. "The next phase is to try and convert some of these images and stories into materials that people can use at a school level, so that kids begin to think about where water comes from."

To work in the environmental field, he says, you have to be an optimist. Vira believes that humanity will recognise the value of what we are losing and find ways to respond to it.

"I think society has shown that once we are aware of these big issues we are able to make these shifts at short notice," Vira says. "See how the BBC's *Blue Planet* has changed how we think about plastic consumption. Suffrage for women, the abolition of slavery – big societal shifts have happened. Society has shown we can make big changes to the way we organise ourselves. I am optimistic." 🗣️

conservation.cam.ac.uk



A daily dish

Artist Klari Reis uses the tools and techniques of science in her creative process, collaborating with biomedical companies to create her unique work. The images on these pages are from her series *A Daily Dish* – a painting created in a Petri dish.

In vitro

WORDS LUCY JOLIN ILLUSTRATION KLARI REIS

The first Petri dish was put into service in 1887. Today, this most humble of scientific instruments remains at the cutting edge of discovery.

Molecular biologist Dr Madeline Lancaster was around 12 years old when she encountered her first Petri dish – one of her biochemist father’s postdocs happened to be growing some neurons. Her father took the dish, put it under the microscope and invited her to have a look. “I was just struck by the beauty and complexity of a neuron,” she remembers. “There is something wonderful about seeing something like that with your own eyes, and the way the light catches it. You can really see the dendritic tree, with all its tiny branches. The intricacy of it is beautiful. That was a real starting point for me.”

Petri dishes, invented by German microbiologist Julius Richard Petri while working for Robert Koch, rarely receive the accolades or the attention that their more complex lab companions like the microscope enjoy. And that’s understandable: they are simple, utilitarian little things, just shallow-lidded dishes, present in every child’s My First Chemistry Set. The real fascination of a Petri dish has always been what’s grown in it – and, indeed, it’s become a handy metaphor for a place where things grow. (A quick, non-scientific search brings up ‘Is Facebook the Petri Dish of Jealousy in Your Love Life?’ and ‘European Elections: A Petri Dish of Populist Dissent.’) When we think about the Petri dish’s most famous moment – Alexander Fleming’s discovery of penicillin – we marvel at the empty ring around the blob of mould, not the dish in which it sits. But Petri dishes deserve celebrating: they are still at the forefront of scientific discovery.

The invention of the Petri dish, and the advances it has helped to create, are part of a bigger whole, of course: the development of glass scientific instruments, from microscope lenses to laboratory beakers. “Glass shifts authority from the word, from the ear, the mind and writing, to external visual evidence,” says Alan Macfarlane, Emeritus Professor of Anthropological Science. In his book, *The Glass Bathyscaphe: How Glass Changed the World* (co-written with engineer, inventor and scientific instrument collector Gerry Martin), he argues that without glass, the Renaissance and the scientific revolution would never have happened. “Thus it could be argued that glass helped change the balance of power from the mind to the eye,” he says. “It makes glass a magical substance: a third kind of matter, neither fluid nor solid, in between.”

Around 70 per cent of what we know about the world comes in through our eyes, Macfarlane points out, and glass instruments enabled us to see better. “But until about 1400, most cultures were living intellectually on the past and what people had been told,” he says.

“You didn’t look at the world, you listened. A child understood the world not by exploring it physically with sight, but by teachers telling them that the sun goes round the Earth or whatever. And the child just accepted it. Glass allowed the growth of the experimental method. Don’t trust what you are being told: see it for yourself. It was transformational.” ›

It's a bit like gardening. You're taking care of this thing. You keep an eye on it and you check it every day. You change the media this day or that day to help it grow better. It's rewarding to see something grow before your eyes





At the Wellcome-MRC Cambridge Stem Cell Institute, Professor Ludovic Vallier says that his first encounter with a Petri dish was a textbook example of understanding the world in this way: students used the dishes to see which bacteria could grow in the presence of antibiotics. “It’s good to see things grow,” he says. “It was a fascinating experience. Now, we grow cells in the Petri dish, and we don’t use glass any more, but plastic.”

Today, his team focuses on human pluripotent stem cells which can be coaxed into becoming any cell type in the human body: neurons, skin cells, liver cells, and so on. Vallier and his colleagues study them in order to understand how they do this, and how they can produce more cells. And to study them, they need to grow them. “We put the stem cells on the dish and then we feed them and they grow, and they proliferate,” he says.

“And then, when they have become confident, we divide them and distribute them in new Petri dishes, and we grow them again. We feed them on a liquid medium that is basically food for cells: it tells them to grow and also what to do, as we want to produce new cells. So by feeding them this media we can allow the cells to become neurons, cardiac cells, liver cells, and so on. We can then model disease in a dish, or produce cells for regenerative medicine applications.”

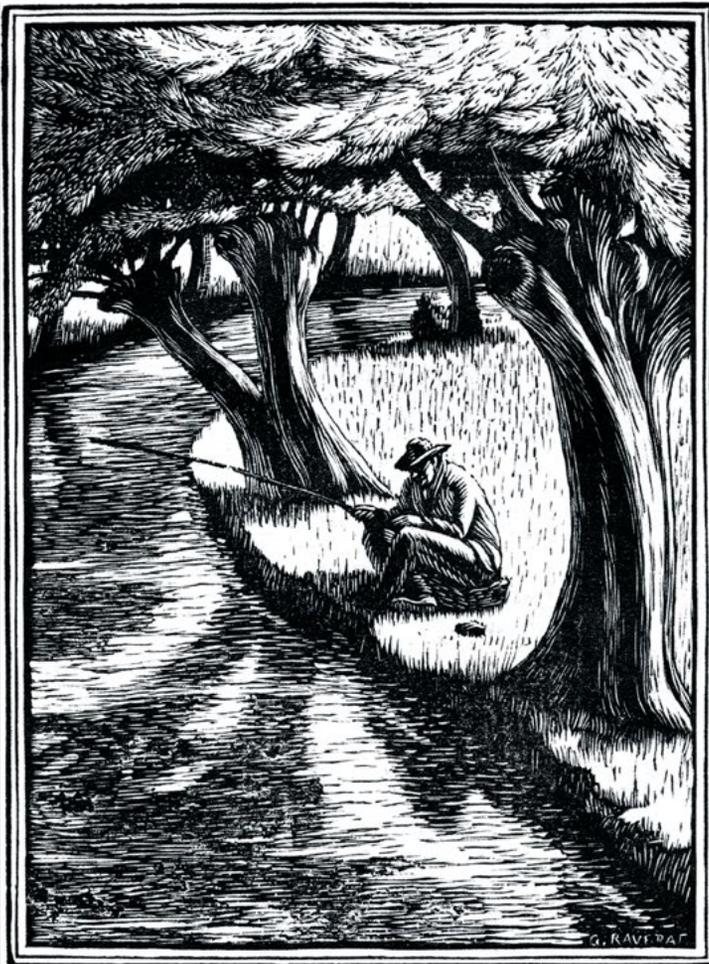
Which means that the Petri dish becomes a place where Vallier and his team, jointly based at the MRC Cambridge

Stem Cell Institute and the Wellcome Sanger Institute, can study – with everything from powerful microscopes to the naked eye – exactly what happens to those cells when disease strikes. “We work a lot on fatty liver diseases and in this case the liver cell in the dish becomes full of fat, which we can see. We can’t cut a piece of liver off a patient: we can’t look inside that liver to see what’s happening. So we are reproducing those diseases in our dishes, and screening new molecules to use against them.”

‘Disease in a dish’ is also the focus of Dr Meritxell Huch’s team at the Gurdon Institute. They use between 50 and 150 Petri dishes every day to grow primary mouse liver and human liver cells, in order to study how the liver can regenerate itself. After a week or so in the dish, surrounded by nutrients, they will self-organise and create a 3D structure called an organoid. Another one to two weeks will see the organoid become thick enough to break in two, creating another organoid that can be kept for more than a year in its dish.

Huch’s team is examining the molecular mechanisms by which these cells decide to proliferate. She says: “You can divide regeneration into different phases. The cells first have to realise that there is damage and activate the response. Once they activate the response, the cells will proliferate to compensate for the loss of cells owing to the damage. And once they have proliferated, they then have to become functional cells.”

Their research recently showed that they could take cells from a patient’s primary liver cancer and grow that same tumour in a Petri dish, reproducing its histology, architecture and genetic mutations. “This work has the ›



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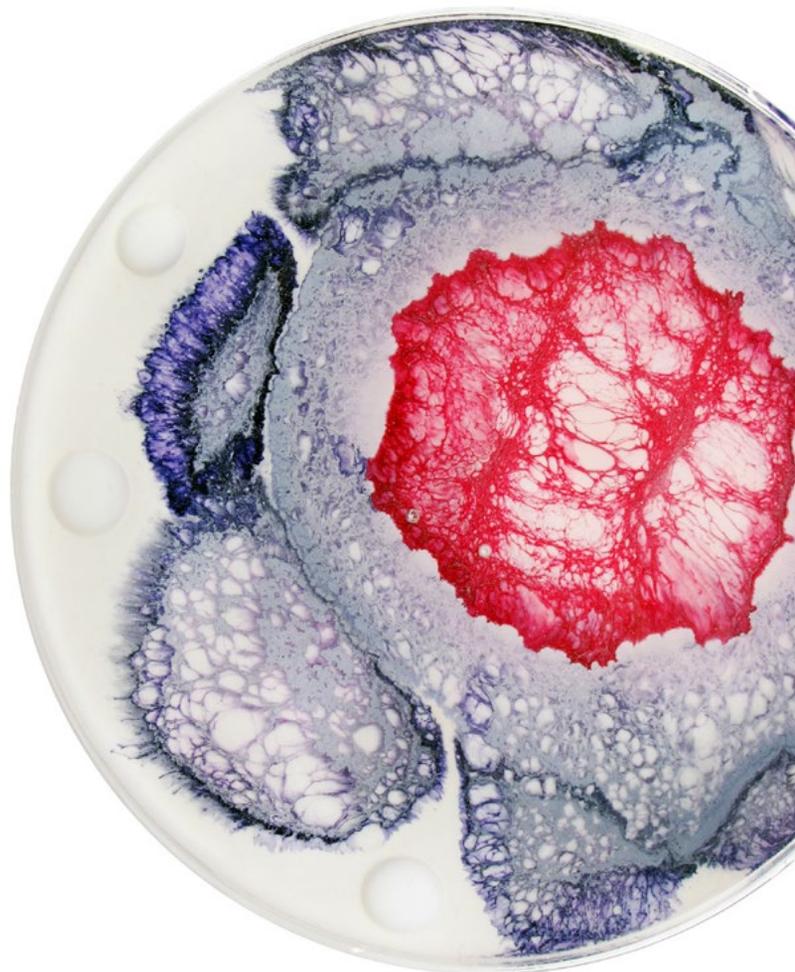
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In a world of cutting-edge and complex technology, Petri dishes, in their relative simplicity, remain a vital tool in the fight against the world's most difficult diseases



potential to give us an answer to whether there will be a good or bad outcome for a given patient,” says Huch. “Our next step is to explore whether this could help us predict, or help to identify, drugs that could help a patient.”

Of course, the Petri dish itself has changed throughout the years. The majority are now plastic, not glass. They have been tweaked and improved to suit particular needs: Huch’s Petri dishes have a matrix made from the proteins collagen and laminin. Her cells don’t sit directly on the surface of the dish but are surrounded by this matrix, which supports stem-cell growth.

At her eponymous lab, based at the MRC Laboratory of Molecular Biology, Madeline Lancaster and her team grow ‘mini-brains’ in hundreds of Petri dishes. Here, the dish is used more as a vessel, specially treated to stop cells sticking and encourage them to float freely.

“We want the brain organoids to be three-dimensional rather than two-dimensional, as that’s the way our brains are,” she says. “If you can grow neurons on a dish in 2D, you can see individual neurons and see what they do, but you won’t be able to understand the architecture of those cells – their positioning relative to one another. You don’t end up with a good representation of how neurons are actually made in the brain. Neural stem cells, which are

the stem cells that give rise to neurons, have a special orientation and they always make neurons in one direction. So if you put a bunch of those stem cells on a dish with no structural information, then they make neurons in random ways. Our method gives you a structure that looks a lot more like the structure of an actual developing brain.”

The aim of these organoids is to look at exactly how neurons are made and how that differs in humans compared with other species. One day, says Lancaster, this work could translate into understanding far more about Alzheimer’s disease, Parkinson’s and schizophrenia. So in a world of cutting-edge and highly complex technology, Petri dishes, in their relative simplicity, remain a vital tool in the fight against the world’s most difficult diseases. And, says Lancaster, they also enable a hands-on approach that she finds satisfying.

“It’s a bit like gardening,” she says. “You’re taking care of this thing. You keep an eye on it and you check it every day. You change the media this day or that day to help it grow better. It’s rewarding to see something grow before your eyes. There’s something about the interplay between new, next-generation and classic technologies. They give you capabilities that were just not possible before.” ©

The Junior Combination Room, JCR, Student Union or, at Peterhouse, Sex Club, is the beating heart of Cambridge student politics.

It is not unusual for the average fresher to miss the significance of the Junior Combination Room. It takes time – and experience – to discover that what appears to be a down-at-heel room in which undergraduates gather is, in fact, a bona fide Seat of Power.

College JCRs debate and make policy that has a real and immediate impact on student life. They have their own constitutions, their own officials and their own – often peculiar – style of direct democracy. And, with the exception of Homerton, with its sabbatical president, they are run by an elected committee of current students.

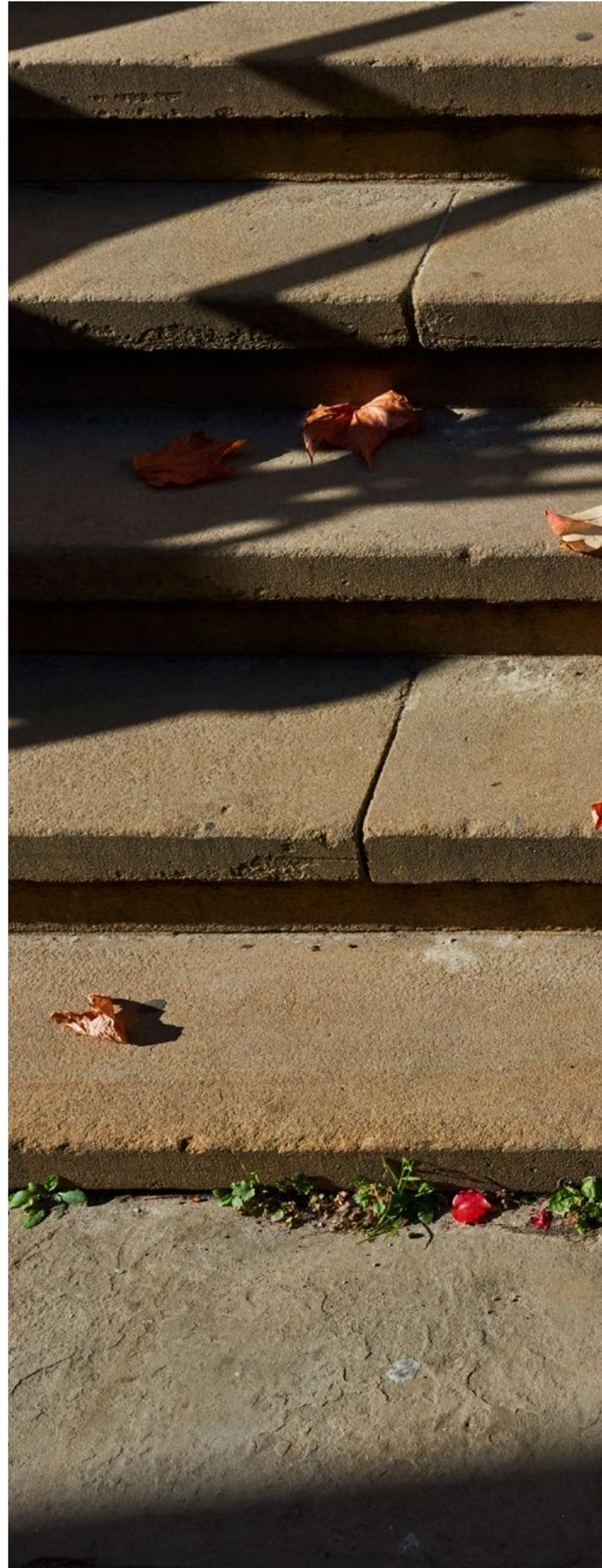
But it can be complicated. Not all JCRs go by the name. They may call themselves a Student Union, Union of Students or Students' Association. Pembroke has a Junior Parlour, and, constitutionally speaking, Peterhouse JCR is still the Sexcentenary Club – a name customarily shortened to the 'Sex Club' when Virginia Murray (Peterhouse 1986) became its first female president in 1988.

"I used to put it on my CV," she recalls. "It was a good way of getting interviews. I walked into one for a pupillage and realised everyone on the panel was staring at me. Their first question was 'What is the Sex Club, and why on earth would you put it on your CV?'"

Mirroring the web of JCRs is a similar structure for graduate students: a student body, committee and room usually known as the Middle Combination Room (and somewhat unfairly caricatured in one *Alternative Prospectus* of the 1990s as "a place where elderly graduates go to watch videos of Channel 4 News"). The MCR may or may not be considered part of a single super-entity with the JCR. Meanwhile, graduate-only Colleges may have a single Combination Room that also includes the fellowship.

Nonetheless, by Cambridge standards, the JCR committee is a recent phenomenon. Towards the middle of the 20th century, most Colleges had a room where junior members could meet, socialise and read newspapers. Its funding, drawn from undergraduate fees, was usually administered by the Amalgamated Clubs – a body of representatives from College sporting societies – and much found its way back to those same societies. Some Colleges maintained a JCR committee as a minor offshoot of this, serving as an informal conduit between senior members and undergraduates. Others had only a JCR secretary to look after administrative duties.

Democracy took a while to arrive. In his 1995 book, *From Our Cambridge Correspondent*, chronicling 50 years of University history as reported by *Varsity*, Mark Weatherall (Selwyn 1986) noted that even at the end of the 1950s, JCR officials might be appointed by tutors (as at Magdalene) ›





WORDS WILLIAM HAM BEVAN PHOTOGRAPHY HARRIET TURNEY BANNERS JOSIE AINSCOUGH & VICKY LEES

We stood for election because we thought we could make things better for people in College and we concentrated on welfare issues. But we also had to deal with the saga of the wicker goat

or by the previous year's members, as at Caius. There, the JCR was run by the Gargoyles – an 11-strong club that was the last-remaining JCR oligarchy when it finally lost power in 1963. During that decade, elected JCR officials became the norm, and the Colleges that had muddled by with a single JCR officer gained full committees. Fitzwilliam was the last to do so, in 1969.

Weatherall points out that the drive for representation coincided with a shift in student demographics. He says: "One big difference between most of the University's history and the modern era is that in the distant past undergraduates were a lot younger – they often came up at 15 or 16. It was almost a continuation of school, and Colleges were really in loco parentis.

"After the [second world] war and up to the mid-1950s, you have an older student population. Lots of undergraduates came up after National Service. They were more politicised, more used to the idea of having representation; and that's when you start to get the idea that JCRs are about students looking after their own welfare as well as their own entertainment. And then you get the more radical student politics of the 70s and 80s, when the JCRs became an obvious rallying point."

Three subjects tended to dominate JCR agendas in those early days – food standards, College bills and gate hours – and a look at more recent minutes indicates that the first two remain very much live issues. On these questions and more, JCRs provide a focus for direct action against the College. The first organised rent strike took place at Emmanuel in 1964, when junior members refused to pay the previous term's bills in a dispute over Hall fees. Since then, few Colleges have escaped similar protests, which have tended to end (as that first one did) with minor concessions all round, ensuring everyone saves face.

Alongside all this, however, is another constant: the comedy JCR motions, joke candidacies and running gags that are impenetrable to anyone outside College. It's something that strikes a chord with Alex Cicale (Fitzwilliam 2013), president of Fitzwilliam's JCR in 2015-16. He says: "In my year, we stood for election because we thought we could make things better for people in College, and we concentrated a lot on welfare issues, especially mental health. We started up Fitzwilliam's first-ever shadowing scheme, hosting A Level students who had no experience of university

in their families. And we did standard things like trying to improve the housing ballot system, which had always been a nightmare.

"But we also had to deal with the saga of a wicker goat that one of the fellows had made for the College. She asked me to pass on a message to the students to stop moving it around to take selfies, because it was getting bashed to pieces. And one of the biggest responses was when we made the pool table free and brought in table football. It's amazing how much of an impact something like this had on JCR popularity, particularly in light of the more nuanced discussions going on behind the scenes."

As well as balancing the worthy and the frivolous, JCR officers have to be both inward- and outward-looking. While party politics are almost absent, and engagement with national and international issues has increasingly taken place at a University level since the evolution of a central student union – CUSU – in the 1970s, Cambridge's JCRs have expended as much effort on activism as on College affairs.

Juan de Francisco Rasheed (King's 2008) was president of King's College Student Union in 2009-10, having served as ents officer the year before. "Campaigning against tuition fees was a big issue," he recalls. "We were probably the most active of all College JCRs in the big protests of the time. We occupied the Senate House and marched in the streets of Cambridge and London. All, as it would sadly turn out, for nothing."

A contentious issue is whether JCR officers should receive any reward for their efforts, beyond a sentence on their CVs. Cicale remembers the question surfacing at a College committee meeting at Fitzwilliam. "We suggested that there should be some modest tokens of appreciation for the committee members' hard work over the year, and one fellow compared us to 'Soviet commissars'."

At Peterhouse, by long-established custom, serving the JCR brings more substantial privileges. Virginia Murray says: "There's a considerable incentive to become president, in that you get to pick the best rooms in College. I had a double set over the Perne Library – the rooms the actor James Mason had when he was at Peterhouse. They were beautiful to look at, though they had almost no heating in those days. And when I went back to celebrate 30 years of women in college, I met the current JCR president and she had the same rooms." ›





Girton JCR

From left to right: Beth Taylor, third-year Psychological and Behavioural Sciences student and JCR Executive Secretary; Liam O'Connor; and Molly Hale.

Liam O'Connor
JCR Treasurer
Third-year, Astrophysics

This year, I'm looking to start a scheme whereby the JCR can pay for one-off prescription costs. I'd like to increase the funding the JCR gets per student – which hasn't increased for several years. And as we have underspent the budget for a few years and have funds saved up, we are looking at ways of putting this money to use.

Molly Hale
JCR Vice-President
Third-year, History

I volunteer with Amnesty and I've done some local campaigning. But this has been the first time I've tried changing an institution from the inside, rather than protesting on the outside. Students on the JCR are given enough power to really contribute to College life so I want to be involved with the things that make Girton special.

From left to right: Alice Hawkins; Jake Kroeger; and Martha Mitchell, third year historian and KCSU Women's and Non-Binary Students Officer.

**Alice Hawkins
KCSU President
Third-year, History and Philosophy of Science**

I stood for President because I wanted to represent the student community that made my uni experience so spectacular. KCSU is comprised of brilliant and engaged student minds. I believe we need to strengthen that student voice at a University level, by calling for democratic accountability at the highest levels of decision-making.

**Jake Kroeger
KCSU LGBT+ Officer
Third-year, History and Philosophy of Science**

I ran for the JCR because I'm interested in College politics and I want to increase sense of community among LGBT+ students. Right now, I'm organising King's LGBT+ Liberation dinner and I'll be continuing to work on both welfare and political aspects of my role and making sure King's fly the LGBT+ flag for LGBT+ History Month.



The most controversial issue in my time was whether an old hammer-and-sickle flag should be allowed to stay in the College bar. A motion to remove it came up annually, with hundreds of students packing JCR meetings to debate the issue.



With reward comes responsibility, and one of the most onerous is negotiating with College authorities. The amount of representation and influence varies from JCR to JCR, and an observer's seat on College Council is more common than one with voting rights. But, sometimes, a bit of psychological engineering is just as effective in putting across the JCR's viewpoint – as Jennifer Richardson (St Catharine's 2002) found out when dealing with the proposed redevelopment of College buildings during her term as president in 2004.

She says: "The College was developing a new conference centre, which meant relocating the bar. And, as I recall, the initial proposals meant the closure of our bar for a whole year while works took place. I was quite firm that this wasn't an adequate solution, and that temporary facilities should be provided, because the bar was the centre of College social life. But I won the argument by suggesting there might be an impact on the academic achievements of the College, because able students would be put off applying to one without a bar."

The thorniest issue of Rasheed's presidency was separating the political from the personal. He says: "The representative with whom I interacted the most on JCR matters also happened to be my director of studies, and a disciplinarian – and I got punished a lot for the parties I used to throw. So I could end up discussing my latest essay, my latest party and the JCR's latest student issues, all in the same meeting."

Perhaps unsurprisingly, the SCR-JCR interaction that causes the most friction is not to do with academic, disciplinary or administrative matters. Catering committee is recalled with a groan and a shudder by many former officers. One former president who spoke to CAM – here granted anonymity – recalls that the situation actually deteriorated when JCR officers installed a suggestion box to provide a direct line to the catering staff.

The president says: "Once, someone asked whether there was any possibility of having a buffet brunch on weekends, with students paying a set amount for all they could eat. The College came back with 'How does £30 a head sound?' And at one formal, a colleague with lactose and other allergies requested a dessert she'd be able to eat. The catering team brought her out a banana, though they were thoughtful enough to present it on a doily."

And, just occasionally, JCR politics can escape through the porter's lodge and make headlines in the wider world. It's something Rasheed discovered as an ents officer, when the spat caused by a *Moulin Rouge*-themed Valentine's party – with burlesque dancers high-kicking on high table – was covered everywhere from the *Daily Mail* to Vietnamese local radio. ("There was a debate as to whether I should be sacked," he says. "The conclusion, after a lot of heated argument, was that the dancers had been inappropriate but that I should keep the job.")

As president, Rasheed first faced a University-wide hullabaloo over the invitation of a UKIP candidate to a hustings at King's event for the 2010 general election. But a greater dispute was over whether an old hammer-and-sickle flag should be allowed to stay in the College bar. "Amazingly, that was the most controversial issue in my four years at King's," he says. "A motion to remove it came up annually, with hundreds of students packing JCR meetings to debate the issue."

"The arguments never changed: on the one side, that keeping it is an affront to those who died under communism, and on the other, that leftwing politics is part of the College culture and it's all a bit of a joke. The outcome also never changed. I think the flag is still there to this day."

With only three eight-week terms and a degree to complete, taking on duties that elsewhere would fall to a paid official is no small commitment – so what's the attraction? Current St John's JCR Co-president Fionn Dillon Kelly is the first to take office with a running mate, Ben Jones, to split the job into more manageable parts. He says: "Previous presidents have had to spend too much time on administrative tasks, so they were unable to enact much real change. That's why Ben and I decided to run together."

"It's also a fantastic opportunity to find out what's going on around College and the University and to gain some important skills – negotiating and meeting with the people who are running College. You can learn a lot from spending time with them."

And for Rasheed, this has proved invaluable. "Participating in the JCR was great training for post-university life," he says. "It was a crash course in running meetings, stakeholder management, delegation ... in many ways, I still draw on my JCR experience today." ©

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Anyone who thinks that books don't matter is only half alive.



Professor Geoff Ward is Principal of Homerton and Acting Director of the Fitzwilliam Museum.

1. LES FLEURS DU MAL CHARLES BAUDELAIRE

It is 1968 and I am 14 years old, sitting in a schoolroom in Manchester. Our teacher hands the class a sheet containing two poems by Baudelaire, the greatest 19th-century French poet, of whom I have never heard. I begin to read *Harmonie du Soir*, and the words are immediately mesmeric, intoxicating, as intriguing when I don't understand the sense as when I do. Poetry has hit me – I don't know yet if I want to read it, write it, write about it (all of which would happen over the next few years); I just knew that my life was not going to be the same again.

2. FRANKENSTEIN MARY SHELLEY

This novel, completed when its author was still in her teens, is amazing as much for its afterlife as for the tale held between its pages. Shelley's novel has ongoing relevance to current debates about genetic editing, artificial intelligence and the social dangers of robots – today's 'wicked science'. This was the theme of a public debate held at Homerton, as part of our 250th anniversary celebrations, featuring me on monsters, our newest Fellow,

Dr Beth Singler, on AI, and Politics Fellow Dr Robin Bunce set to edit and expand our thoughts in a book. Plugging into this level of interdisciplinarity is one of the gifts of College life.

3. THE COLLECTED POEMS FRANK O'HARA

Frank O'Hara is the poetic voice of New York – his lines crowded with motion, people, noise, accidental encounters and near-misses. O'Hara died in an accident in 1966, but later I would meet his friend and contemporary, John Ashbery, beginning a four-decades-long conversation of our own as well as inspiring me to write the first critical book on the New York School of Poets. Anyone who thinks that literature doesn't matter is only half alive. Books and lives lean in, confer, depend on each other.

4. HAMLET WILLIAM SHAKESPEARE

I guess this is the greatest play by the greatest playwright, if not the greatest mind, who ever lived. Watching actor Simon Russell Beale (Caius 1979) give a masterclass on Hamlet's soliloquies recently brought back once again how

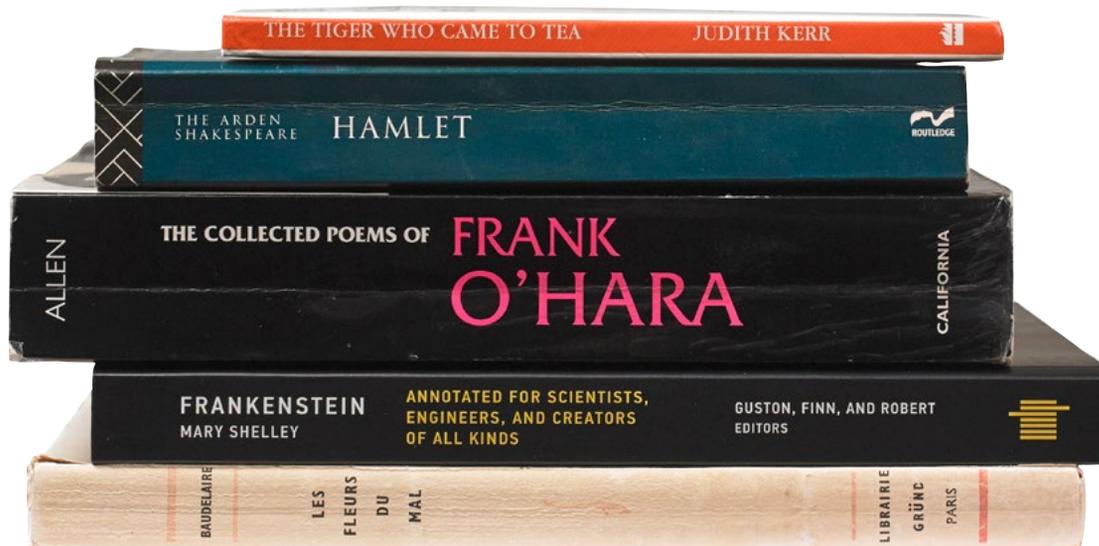
those twisting and feverish speeches go everywhere human it is possible to go – back to the origins of tragedy, forward to Freud and our own age. In 2008, I was in the front row to watch David Tennant's Hamlet and narrowly missed being struck by a book thrown in Ophelia's direction. But that, I guess, is just one rather literal example of the impact of literature ...

5. THE TIGER WHO CAME TO TEA JUDITH KERR

Another side of fiction that comes in for serious debate and celebration at Homerton is children's literature, with two annual lectures and an essay prize. My fascination with *The Tiger Who Came to Tea* comes from reading it to my own children and returning with undiminished pleasure to its simplicity and strangeness. Kerr spent her early years in Berlin, where her father's name was on a Nazi death list. Fortunately, the powers that be were looking elsewhere and the family escaped. Is the tiger simply a tiger?

This year, Homerton celebrates its 250th anniversary. To join the celebrations please visit homerton250.org.

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It's 25 minutes long and every note is etched on my mind

Robin Holloway (King's 1963), composer and former Professor of Musical Composition.



**DIE GLÜCKLICHE HAND
ARNOLD SCHOENBERG**

In 1964, I raced back to my room at King's having bought Vol I of Schoenberg's complete works – and this is the piece that blew me apart. It's an incredible expressionist one-act opera, a colour crescendo that is also a crescendo of emotion. It is around 25 minutes long and I must have played it about 20 times that day. The orchestral dazzle, which was also vocal dazzle, was absolutely electrifying. Every note is etched on my mind.



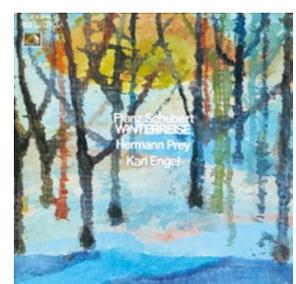
**SYMPHONY NO.3
GUSTAV MAHLER**

I heard this when recordings and performances were few and far between. My friend John Fletcher, later the principal tuba player of the LSO, got it on the day of release and we all gathered round in his room in Pembroke to listen. I already had the score – I had bought it in celebration the day I met Benjamin Britten for the first time, August 1959, just before my 17th birthday, and dared to tell him I wanted to be a composer.



**TURANGALĪLA SYMPHONY
OLIVIER MESSIAEN**

This was another amazing purchase. First, it was so luxuriously packaged, all crimsons and purples, very exotic. And inside was this most over-the-top, extreme music. It's the Tristan and Isolde story recast, and Messiaen uses an Ondes Martenot, capable of a very large amount of noise, for all the erotic bits. It burns right through you. I had one or two friends who would gather to listen – we were 18 or 19 years old and it blew our little minds!



**WINTERREISE
FRANZ SCHUBERT**

This was an incredible Guildhall concert moment as an undergraduate, hearing Benjamin Britten and Peter Pears giving their fantastic all to Schubert's desolate song cycle for tenor and piano. It is a piece that bites you to the bone. As we left the hall, I spotted EM Forster. I was just longing to ask him what it was like to write for Britten as Forster had written the libretto for Billy Budd. So I did, and Forster very kindly invited me to tea.

PHOTOGRAPHY: SARA LUCAS AGUTOLI

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A year of listening

Professor Stephen J Toope (Trinity 1983)
is the University's Vice-Chancellor.

Over the past 12 months, I have had the great pleasure of travelling across the Collegiate University, meeting with the exceptional people who make Cambridge the world-leading institution that it is.

I have confirmed first-hand what I could only speculate about a year ago: that the excellence on which our reputation rests is genuine, and widespread.

As part of getting to know and understand the University, I have also spent much time listening to staff and students through a formal consultation process – *mycambridge*. A report summarising the feedback to the consultation has just been published.

The consultation, alongside my various formal and informal meetings with staff and students, has offered a unique opportunity to understand where our greatest strengths lie – as well as a frank assessment of what challenges and risks we face.

The questions raised through the consultation go to the heart of our work. How do we maintain and enhance the infrastructure needed for our research at a time when traditional sources of public funding are diminishing? How do we give our students the best experience we can – from offering appropriate financial support, to ensuring their academic and personal wellbeing needs are fully met? How do we put in place the right incentives and supports to sustain and expand our excellence in teaching? How do we ensure that all our staff – in academic, administrative and assistant roles – are fairly rewarded, and appropriately encouraged in their professional development? How do we nurture a truly welcoming, diverse and inclusive environment for students and staff? How do we remain a global university, open to talent and to partnerships around the world, even as we grapple with the uncertainties of Brexit?

Few of the issues that emerged from the consultation are entirely surprising. But the consistency with which some of them were raised gives me a clear indication of where

“**Today I am more ambitious than ever for our University. I also recognise that, to deliver on our ambitions, it is essential we adopt a stance of modesty, of listening to others, and of learning from their concerns and experiences**”

”

our priorities must lie – not only in the year ahead, but in the years to come.

I am pleased to note that, across the University, work is already under way to address many of those priorities. From our engagement with local authorities over

housing and transport, to our initiatives for widening participation in admissions; from our efforts to enhance the University's global presence, to our initiatives promoting equality and dignity in the workplace – I have witnessed teams across the University intensely engaged in serious efforts to make Cambridge the university we all want it to be.

The end of the consultation is not the end of the conversation. I am confident, however, that what I have heard over the past 12 months allows me to sketch out some widely shared objectives and common goals.

The first of these must be to safeguard those unique elements that have made our university an exemplar of learning and scholarship globally: a fundamental commitment to critical thinking and academic freedom; a tightly knit community of colleges that fosters interdisciplinary dialogue; a democratic system of governance that includes, and benefits from, diverse viewpoints; a robust system of deliberation that ensures our university's values are maintained in all our partnerships – whether in research, education, or philanthropy; and a common recognition that Cambridge must be a local good citizen, a regional champion, a national asset and a global leader.

I said a year ago that I wanted our University to be “an unstoppable, unapologetic force for knowledge and understanding, for more inclusive community, and for the betterment of our shared world”.

Today I am more ambitious than ever for our University. I also recognise that, in order to deliver on our ambitions, it is essential that we adopt a stance of modesty, of listening to others, and of learning from their concerns and experiences.

We have to be better at listening to our society – locally, nationally, globally. We have to be better at sharing the knowledge we create. And we have to be better at telling the story of what we do, how we do it and why.

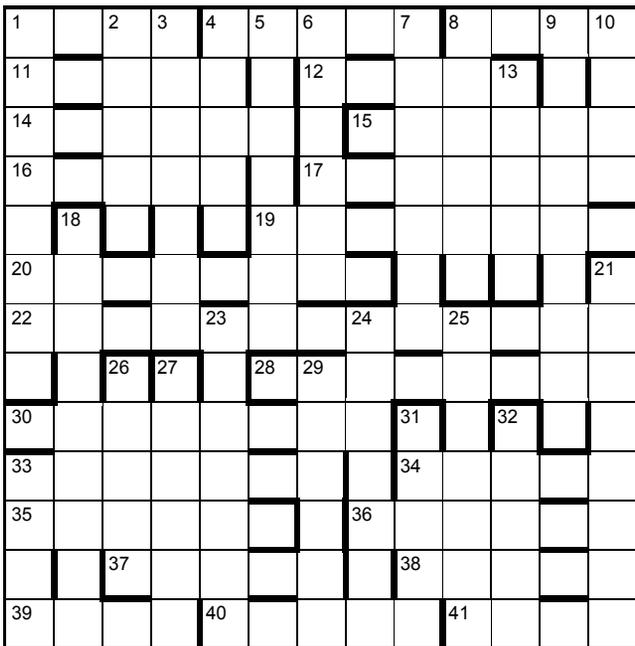
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CAM 85 PRIZE CROSSWORD

MEN ON BOARD

by Schadenfreude



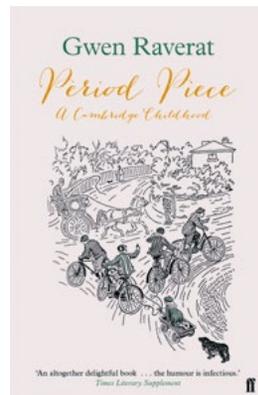
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Two runners-up will also receive £50 to spend on CUP publications.

Solutions and winners will be printed in CAM 86 and posted online on 8 February 2019 at alumni.cam.ac.uk/magazine



INSTRUCTIONS

From 15 clues solvers must remove a word which has only one letter in common with its answer. In reverse clue order these letters provide the theme. Clashes in some cells must be replaced by a number or in three cases a word. Numbers in brackets are the grid entry lengths.

ACROSS

- Active bee leaving wood westbound - I note a red colouring (4)
- Heartless married man mixed a drug to combat nausea (5)
- Greedy monkey returned following date trees (4)
- Was a French seabird free? (5)
- Censure strong work (5)
- Note Irish sketch (6)
- Lively Yankee leaves licentious revel to consume a sweet drink (6)
- Straighten bent nail securing centrepiece of hanging (5)
- Before rearranged run bather developed severe indigestion (7)
- A colourful trained exotic plant (8)
- Fashionable German in disguise meeting European to use cajolery (8)
- I tucked into mixed seasonal iced cold dish (13, 2 words)
- Dausset's perfect article on disease is not in accordance with Jewish law (8)
- Halved offensive smells on bog plants (8)
- Bush fire destroyed entrance to rotunda - renovator is the answer! (7)
- Stranger at no time drinks whiskey (5)
- Dusty man on board caught abandoning creature for some wench (6)
- Short news article covering absolute conscious state sought by Zen Buddhists (6)
- Transitory light wind to turn obliquely (5)
- Hired men nicking German motors (5)
- Egocentric dwarf remains quiet on the outside (4)
- Old man without any force accepts electronic stuff that's useless (5)
- Car door reflected a metallic lustre (4)

DOWN

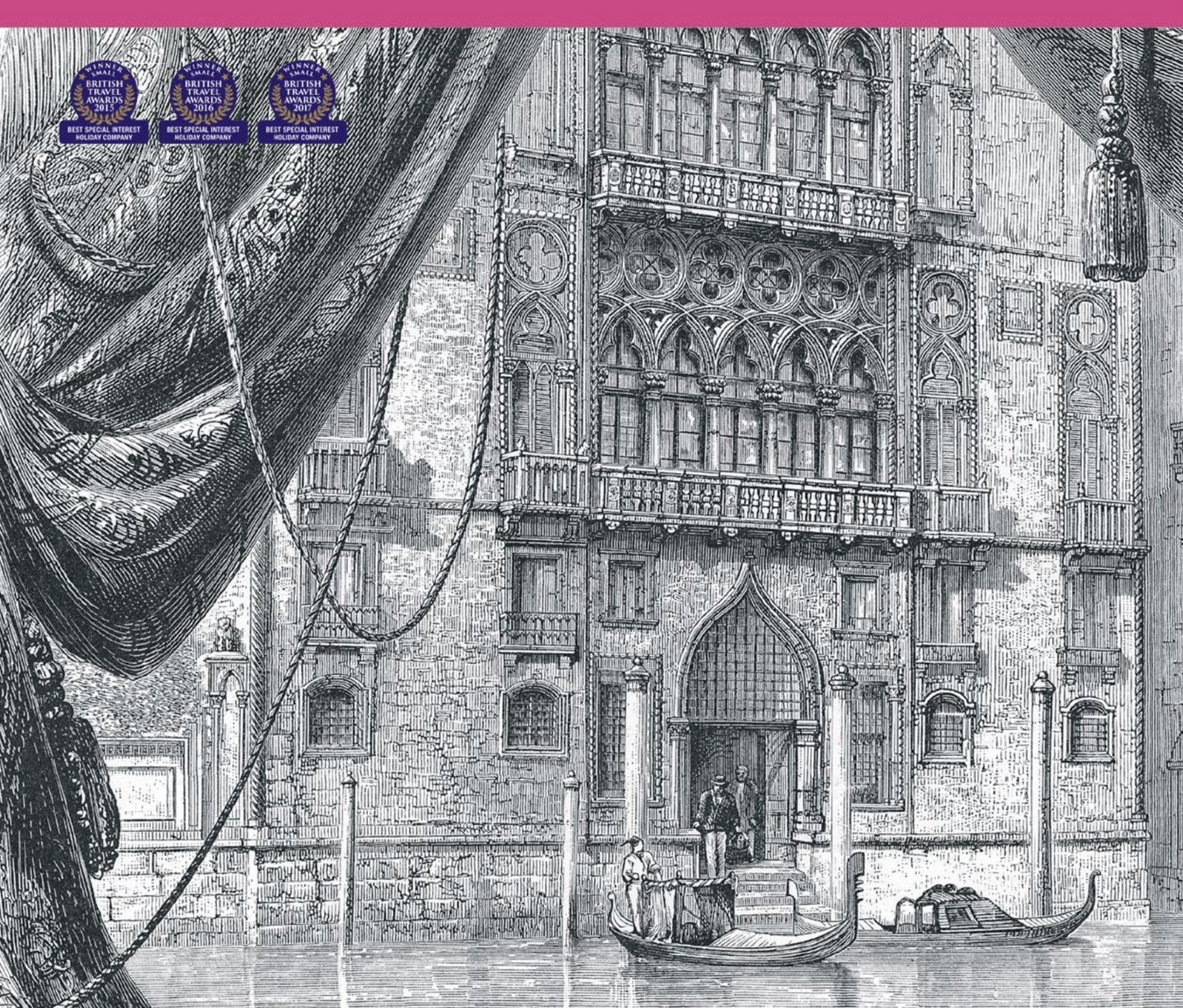
- Make impersonal maiden use rogue to catch husband (8)
- One member on time carrying note "Inject Once" (5)
- Duck found in Aegean's wild biological region (7)
- East wind destroyed Scots pine (5)
- A boring deb's pretentious Somerset community (7, 2 words)
- Current solicitor carries explosive joining line (6)
- Volatile Elizabethan's set on rising in command post (7)
- Sound picture detailed product of Indian village (6)
- Anonymous bisexual sheltered by occult temple is regaining life after seeming to be dead (9)
- Third son determined and hard (4)
- Explosive component, favourite with engineers (5)
- Short simple pub snack following second mixed drink (9)
- Rename awfully rich street in unopened grassy land (8)
- Hammer magistrate on active duty grabbing hospital nurse (7)
- Deeply involved I'm pursued by director across Wick's marshland (7)
- Policeman doesn't begin to arrest alien swimmer (7)
- Does contract imply dishonesty from the south? (5)
- Energetic sort who shut out the French resistance (6)
- Molluscs once follow a course up tree stump (6)
- Servant in shelter lifting paint (5)
- Society hostess out of heroin used indecent language (5)
- Wild cats run into young hawk (4)

SOLUTION TO CAM 84 CROSSWORD MEKEEKROE LEO (DETECTIVE WORK) BY SCHADENFREUDE



The phrase is THE MEMOIRS OF SHERLOCK HOLMES which usually consists of 11 short stories. In clue order the encoded answers are (Stockbroker's) CLERK, (Final) PROBLEM, GREEK (Interpreter), YELLOW (Face), NAVAL (Treaty), REIGATE (Squires), RESIDENT (Patient), CROOKED (Man), GLORIA (Scott), (Musgrave) RITUAL, SILVER (Blaze). The encoded instruction is "HIGHLIGHT APPROPRIATELY THE GRID ENTRY THAT CAN BE PAIRED WITH AN ENCODED ANSWER". FACE was to be shaded YELLOW. CARDBOARD BOX is sometimes included as a twelfth story and Squires is sometimes replaced by Squire or Puzzle.

Winner: Annie Parsons (Robinson 2003)
Runners-up: Richard Cawkwell (Jesus 1970), David Pritchard (King's 1995)
Still struggling? Clue notes can be found at: alumni.cam.ac.uk/magazine/cam-84



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