

First published in 1949, *Felix* is released weekly during term time and is distributed around Imperial's London campuses. All students, staff, and alumni are welcome to contribute to the paper.

Felix

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SCIENCE

Imperial professor's insight into Nobel Prize-winners

Science Editor Taylor Pomfret speaks to Professor John Marangos about this year's Nobel Prize-winners in Physics.

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ENVIRONMENT

Do fossil fuel companies have a place in the Science Museum?

Felix explores the Science Museum's links to FFCs.



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MUSIC

Decibel review

Deputy Editor Zanna Buckland reviews ICU's Decibel club night.

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BOOKS

Jon Fosse wins Literature Nobel Prize

Norwegian playwright, novelist and poet lauded for intimate, vulnerable oeuvre.

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Marking mayhem

69 Physics undergrads submit complaint to College after MAB leaves department in chaos.

News Writer

MOHAMMAD MAJLISI

Editor-in-Chief

JAMIE JOHN

Undergraduate students from Imperial's Physics department have submitted a formal complaint to the College's Student Complaints Services over the department's response to strikes, and the marking and assessment boycott (MAB). The students also claim to have lost one in every 10 hours of lectures to strikes during the 2022/23 academic year.

The complaint to the College – submitted by an undergradu-

ate Physics student, and backed by 68 of their peers – asks for a partial refund of tuition fees. *Felix* understands that the students want 15% of fees for the year to be returned to them. For home students, this would amount to a payout of £1,387.50. International students would receive £5,430.

Only 55 of Imperial's 2,107 academic and teaching staff are participating in the MAB, but a disproportionate number are members of the Physics depart-



UCU members picketing last week. Rolando Charles

ment. This means that Physics undergraduates have been badly affected by the boycott. During the MAB, boycotting staff cease all summative marking and associated assessment duties.

The Physics department worked to ensure all students due to graduate were able to do

so, and gave third- and fourth-year students detailed updates on the grading process. However, students in their first and second years of study in 2022/23 were left in limbo.

“They spent the entire year telling → [READ MORE ON 6](#)



College fossil fuel investment policy is “embarrassing,” says Union President

→ [READ MORE ON 4](#)

DECLARATION

At *Felix*, we believe that it is always in the interest of the students to be in the know. Transparency in the workings of the College and the work of your student representatives is key. Therefore I, the *Felix* Editor, on behalf of the team promise that:

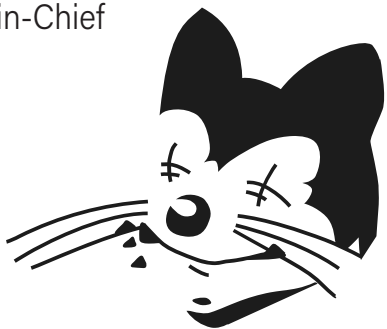
We will, to the best of our ability, tell you the whole truth and nothing but the truth.

We will keep your confidence and will only publish something you say to us if you have explicitly said that we can.

We will work to expose unfairness and discrimination in all forms that it takes at the College.

We will treat fairly any article sent to us, regardless of point of view, and do our best to work with you to prepare it for publication.

Signed by:
JAMIE JOHN
Editor-in-Chief



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JAMIE JOHN
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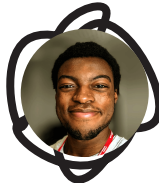
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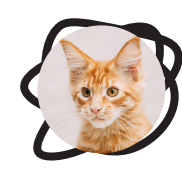
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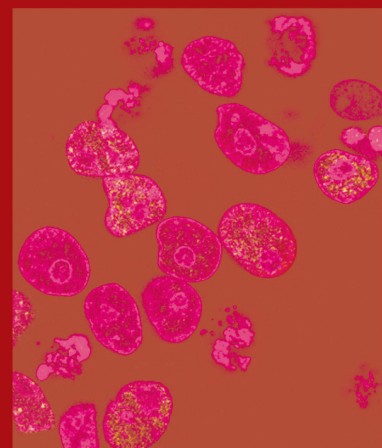
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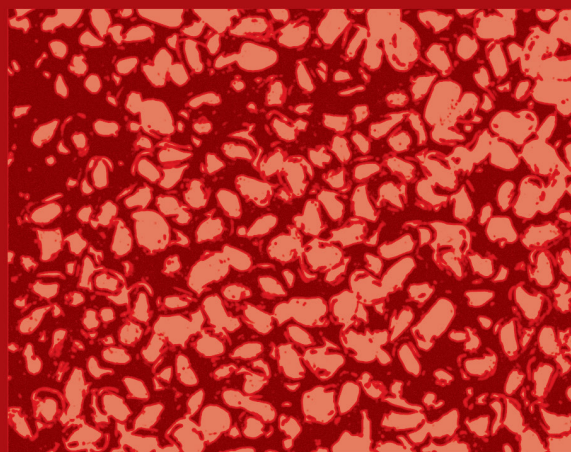
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EDITORIAL

The room where it happens

This week *Felix* interviewed Camille Boutrolle, the new President of Imperial College Union. The most interesting talking point to arise from the interview was her condemnation of the College's investment policy as it pertains to fossil fuel companies (FFCs). Boutrolle called the policy "embarrassing", saying it sent "the wrong message".

The College has, since 2020, responded with the same defence when questioned on its FFC investments. It says that actively engaging with some FFCs will enable it to have a longer-term impact than divestment. 'We have been clear that we will monitor progress, and only continue to work with companies who demonstrate commitment and credible action to achieve [Paris Agreement] targets,' reads a recent statement sent to *Felix* on the matter.

Boutrolle, however, has a fundamentally different view of Imperial's role in the transition to net zero. Imperial is "a research institution, not an investment firm," she said. She sees the College's continued investment in FFCs as a "poor example", and feels that if it is to invest in any companies, it should be doing so in ones that are "actually trying to make a positive change and not just offset their use of fossil fuels".

Boutrolle's stance represents a victory for the divestment movement at Imperial, and is part of a bigger story of student politics at the College. For several years now, various student-led campaigns have sought to convince Imperial to stop investing in FFCs. Divest Imperial carried the torch for some time, and was especially active in 2019/20 with its

stunts on campus. It achieved its biggest success as part of the working group that developed Imperial's Socially Responsible Investment policy in 2020. In that policy document, which sets out Imperial's current position, the College agreed to divest from FFCs that are not working towards meeting Paris Agreement targets.

But for many students, this was not enough – they wanted more: divestment from all FFCs, with no exclusions. Over the past two years, Imperial Climate Action (ICA) has emerged, acting as a conduit for this group. ICA has been vocal, but the College has not changed its position on FFC investment.

Your Editor recently watched the Broadway show *Hamilton*, and some of Boutrolle's words echoed those of Aaron Burr in the musical. A running refrain throughout the show is Burr's desire to be in 'the room where it happens'. Burr wants to be present when the most important political decisions are made – to have a seat at the table, so that he can influence policymaking.

"We just need a voice in that room where decisions are made," said Boutrolle, speaking with reference to the College's wider sustainability policy.

Finally, after years of campaigning, student environmentalists have a seat at the table, a place in 'the room where it happens'. Yes, Divest Imperial had a say in the College's current policy, but in Boutrolle, activists have a Union President – the most prominent student voice on campus, and a member of College Council, Imperial's governing body. And she certainly isn't afraid to make her views known.

NEWS

*The OT Interviews***Camille Boutrolle**
Union President*Illustration by Natalie Yu***In this series, Felix talks to the Union's Officer Trustees. First up: Camille Boutrolle, Union President.****Editor-in-Chief**
JAMIE JOHN

This time last year, Camille Boutrolle had just completed a four-week summer internship with EY's Corporate Finance division, and was weighing up her options. She held a return offer from EY, but wanted some more time to mull over things.

"You're seeing people go off to do internships with these huge banks, and there's this notion of associating jobs at these companies with success," she tells me when we meet in late September. "I was intent on doing a gap year to sit back

and figure things out."

It was around this time, Boutrolle says, that she started to consider running for a position as an officer trustee (OT) of Imperial College Union (ICU). "My experience at Imperial was really fulfilling, and I don't think everyone has that, so I wanted to try and change things," she explains.

The Union is run by five Officer Trustees and a team of permanent staff. The Officer Trustees (OTs) are elected representatives of the student body, who take a year out of their studies to lead Imperial College Union.

There are five OT positions: four Deputy Presidents, responsible for specific

aspects of the student experience, and one Union President. The President is ultimately responsible for the Union, and also sits on College Council, meeting regularly with senior Imperial staff and acting as the voice of the student body.

Boutrolle wasn't particularly familiar with the Union, she admits – her experience of the institution was through Imperial's sports clubs, having held committee positions on a number of them.

The natural role for her, given her experiences, was Deputy President (Clubs & Societies). She spoke to Dylan Hughes, then holder of the position. "I realised he was having a tangible impact on the student experience. He really sold it to me."

Soon though, Boutrolle realised that her interests didn't fall into the Clubs & Societies portfolio. "I came from a background in South London where I wasn't privately educated, and felt quite under-represented when I came to Imperial. I also did an engineering degree with a very poor female to male ratio, so outreach was something I really wanted to work on."

"Also, in my fourth year, one of my good friends was heavily involved in Imperial Climate Action [ICA, a student advocacy group whose mission is 'to work with the College to encourage sustainable policies that are environmentally and socially responsible']. It opened my eyes to the fact this is something that isn't really going away."

Boutrolle attended one of ICA's lunch-time meetings and was inspired. "I thought, 'Yeah the Union needs someone who really cares about sustainability.'"

"I love sports and that was a huge part of my undergrad degree, but there were bigger things I wanted to change."

And so, she ran for President.

As Union Presidents go, Camille Boutrolle is atypical. Last academic year, Felix compared her resume to those of her predecessors; every one of them for the past six years has served as a constituent union president (representing scientists, engineers, medics or business students) before taking up mantle of ICU President.

Throughout our conversation, she is candid about her lack of experience. "I

was never involved in Union Council, any of the constituent unions – none of that. I was a year-group representative one year for my course, but that's about it."

Boutrolle's inexperience is evident in some of her manifesto pledges. A plan to make microwaves and other amenities widely available across campus drew ridicule from some quarters; it is a stark contrast to the legislative goals put forward by previous ICU Presidents. But, she says, "I've got so much support for the idea – Estates [responsible for College facilities] are already on board." Some might describe the plan as low-hanging fruit, but Boutrolle would likely point out that she is the first to pluck it.

"People would still laugh at me now about that," she acknowledges. "But in my final year, I lived with a girl doing a postgraduate taught degree, based in Hammersmith and White City. The amenities at Hammersmith are just awful. It feels like sometimes the South Ken campus is prioritised because that's where senior management is, and I wanted to reform that."

"It's all well and good talking about big things that don't affect students that much now, but what's going to make a tangible impact for students who are currently here?"

In total, Boutrolle has four goals for the year:

1. Amenities (such as microwaves) readily available across all Imperial campuses.
2. 'Striving for a top-50 ranking in the People & Planet league tables.'
3. Further outreach programmes to diversify Imperial's population.
4. A 'cross-register' scheme with LSE, and more IDX opportunities [in which students can study modules from other degree courses].

She admits she has overreached with the 'cross-register' proposal, in which students at Imperial would be able to register for courses at LSE, and vice versa. Students are not yet able to register for modules on other degree programmes at Imperial; Boutrolle says she needs to address this first.

She has also found that Imperial is al-

ready developing further outreach programmes (goal iii)). “I’ve realised that actually the most important thing I can do here is work on the Access and Participation plan, because it’s something they legally have to produce, and have to stick to – so it’s quite impactful.”

The Access and Participation plan aims to increase admissions of underrepresented students and close attainment gaps between students from different backgrounds. The Office for Students requires universities to have such plans if they want to charge above the basic tuition fee cap – which Imperial does.

Of her four goals, Boutrolle speaks most passionately about her sustainability pledge (goal ii)). Specifically, she says she wants Imperial to divest its money out of fossil fuel companies.

Imperial says it will continue to invest in fossil fuel companies which are striving to meet Paris Agreement targets. But Boutrolle is unequivocal: “We’re supposed to be a world-leading institution. We literally have research on the effects of climate change, and we’re investing in these companies. It sends the wrong message and downplays all the good work we’re doing.”

“You need to lead by example when you’re Imperial. We need to be sending off our graduates with the right attitude towards climate change.”

The College argues that its investments allow it to have a longer-term influence on decarbonisation than divestment would. Boutrolle dismisses this position. “I just don’t think that’s the role of Imperial – it’s a research institution, not an investment firm. And there are better companies out there actually trying to make a positive change and not just offset their use of fossil fuels. Imperial is one of only a few Russell Group universities that still hasn’t divested from fossil fuels – it’s embarrassing.”

Boutrolle intends to use her position as the student voice in Imperial’s corridors of power to show that students want change. “Imperial hasn’t – until recently – really cared about this,” she says. “I do think they genuinely care about student experience, so we just need a voice in that room where decisions are made raising the issues people want to speak about.”

She has already started talking to environmental charities, and says she will be speaking to People & Planet – the charity referenced in her goals – the following week. She tells me that one easy way Imperial can move up People & Planet’s sustainability league tables is by better reporting its existing initiatives.

“It’s been a steep, steep learning curve,” says Boutrolle, when I ask about how she’s found the role so far. “When I started, I was learning not only how the Union ran, but also how the College worked, and how the two worked together simultaneously.”

The ICU President effectively has two roles: they serve as the political figurehead of the student body, and also, as the CEO of Imperial College Union, a charity with an



“It’s embarrassing”: ICU President delivers stark rebuke of College fossil fuel investment policy

Imperial says it invests in fossil fuel companies (FFCs) that demonstrate ‘commitment and credible action’ towards the net-zero transition.

But Boutrolle has called for the College to divest its money away from FFCs. “I just don’t think that’s the role of Imperial,” she said. “It’s a research institution, not an investment firm. And there are better companies out there actually trying to make a positive change and not just offset their use of fossil fuels.”

“Imperial is one of only a few Russell Group universities that hasn’t divested from fossil fuels – it’s embarrassing.”

annual turnover of £10m.

Boutrolle seems to have thought extensively about lobbying the College, but not so much about her position at the head of the Union. “When I was running, the former was definitely my view,” she says. “I thought of my manifesto points, and then that I’d get elected and figure it out later – the ‘CEO’ part is something I’ve become aware of since I started.”

“The Union’s permanent staff have been very supportive in helping her with this, and have the expertise to help on the operational side of the role.

She says she works harder now than she did during her Aeronautics degree. “If I’m not having any impact here, it just doesn’t sit right. Whereas with my degree, I could be guilt free about a lot of it.”

Boutrolle believes the biggest challenge facing the Union is engagement with Imperial’s international student community. Imperial’s most recent annual report showed that EU and international students make up half of the student population. Chinese students alone account for a quarter. “I don’t think the Union represents that at all,” says Boutrolle. “It’s two-fold: we don’t represent them well because we don’t get the engagement, but we need to work on getting that engagement, so that we understand how best to represent them.”

How should the Union address this challenge? “I don’t have a whole solution yet, but I think by leverag-

ing people’s experiences.” Boutrolle notes that two ICU Deputy Presidents Yi Yang and Stephanie Yeung – are international students, and says she wants to use their insights. “I also feel bad when all international students are grouped into the same bucket – growing up in China is very different to growing up in India, which is different to growing up in Nigeria.”

“This is a business model – ‘home versus overseas’. We need to understand who our students are and how we can help with their issues – like are there visa issues? Or for example, if you’re from a former colony like India, you can vote in the general election – do people even know that?”

And finally, what would she suggest to anyone who wants to run for her role next year? “Talk to me. You want to know exactly what you’re signing up for, and how to best prepare for that. For example, I wish someone had told me what Union Council was, and that you could just rock up. You can just sit in, observe, and understand.”

“Also, I got scrutinised a lot on the fact that I didn’t have the necessary experience – especially by Felix. Sometimes it’s not about how much you know, but whether you can bring the fresh perspective. It’s important not to have constituent union presidents roll into Union President. I don’t feel those people always have a real feel for what students want. Yes, I’ve had to learn a lot in a month and a half, but now I have the knowledge, I can do things a bit differently.”

→ FROM P. 1: MARKING MAYHEM

us how they were improving student satisfaction and then did this with our results," said one undergraduate physicist. "I have lost all faith in the department that they are actually trying to improve our experience."

Carlo Contaldi, Deputy Head of Department (Education), said: "MAB was very traumatic for some of our students – those ones that weren't lucky enough to be third and fourth years where we had to do all the hard work to mitigate. And there are still outstanding marks that they're missing."

"The thing I'd like to stress is how seriously we take in this, it's not a simple lip-service exercise."

"Poor communication and baffling decisions"

One of the complainants' principal grievances is poor communication from the department. An email sent to students in May specified which examinations had not been marked as a result of the MAB. But, allege the complainants, it later transpired that the details in the email were incorrect.

Furthermore, in mid-July, students were sent emails to inform them of their progression status. At this time, some modules had been marked in full, and some only partially, as a result of the MAB.

The department told students that, provided they had passed all the fully-marked modules, they would be given provisional passes – allowing them to progress to the next year.

If it was later found that they had failed a MAB-affected module, they would have to resit the relevant exam in the next academic year (2023/24).

To avoid the risk of an additional exam the following year, students were told they could resit the exam in August 2023 – before they knew whether they had failed. "On what basis does the department [think] the student should resit the exam?" asks the complaint.

"This is an unenviable choice," it continues. "Either suddenly revise for an exam with only a month's notice – potentially only to find out that you actually passed – or cram the exam in with a multitude of others in the following year."

In order to aid students with the choice, the department reviewed the marks they did hold, and made a judgement on wheth-

er it was likely students would pass the affected modules. The complaint submitted to the College says it was unclear how this judgement was made.

Some second-year students on the MSci track were distressed to find that the department had advised them to transfer to the BSc programme. The Physics department requires that students achieve above a certain grade threshold in order to progress to an MSci. "Due to the marking and assessment boycott, we cannot confirm whether these criteria have been reached," reads one email advising a student to transfer to a BSc.

"We are being pressured to take decisions with incomplete information, on short notice, and with poor communication," summarise the complainants. They allege that the problems they have encountered are "part of a wider culture of poor communication and baffling decisions".

Some students have told *Felix* that they remain in a state of confusion. One said they were left "critically depressed and anxious".

"The teachers have every right to strike, but the department has been fucking inept at dealing with the fallout," said another.

Contaldi, the Deputy Head of Department, said that improving communication was his "number one priority", and that the department was recruiting more staff to address the problem.

"We have a huge, huge focus on this now," he said. "We're increasing the admin support we have in delivering the undergraduate degree, because we've been understaffed for many years. It's going to be a real game-changer for Physics."

The department has appointed Professor Richard Thompson to investigate the complaint, and the outcome of his investigation is expected in the coming weeks.

Psst... physicists



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NEWS THREADS

Weekly bulletin



College stance on fossil fuel company investments is "embarrassing", says ICU President

ICU President **Camille Boutrolle** has delivered a stark rebuke of the College's policy on fossil fuel investments. The College says it invests in fossil fuel companies (FFCs) that demonstrate 'commitment and credible action' towards the net-zero transition. But in a wide-ranging interview with *Felix*, Boutrolle called for Imperial to divest its money away from FFCs. "I just don't think that's the role of Imperial," she said. "It's a research institution, not an investment firm. And there are better companies out there actually trying to make a positive change and not just offset their use of fossil fuels." (pp.4-5)

Physics undergrads submit complaint to College after MAB leaves department in chaos

69 undergraduates from Imperial's Physics department have submitted a formal complaint to the College over the department's response to the marking and assessment Boycott (MAB). The complaint asks for a refund of 15% of tuition fees for the 2022/23 academic year. Physics students have been disproportionately affected by the MAB, as many boycotters are members of the department. Students in the first two years of the undergraduate programme have been left in a state of uncertainty. Some have still not received their examination grades for 2022/23, and many have struggled to secure their preferred modules for this year as a result. (p. 1 & p. 6)

Three arrested in protests on High Street Kensington

Three people were arrested by police on Monday night after **pro-Palestinian protesters** gathered outside the Israeli Embassy on High Street Kensington, just a 15-minute walk from Imperial. Smoke filled the air as protesters lit flares, waved flags and chanted "Free Palestine". At High Street Kensington Tube Station, police officers were forced to intervene when tensions between Palestinian and Israeli supporters threatened to boil over. The protests came as Hamas, the Palestinian militant group governing the Gaza strip, launched a surprise attack on Israel. Its fighters entered Israeli border villages, killing civilians and taking dozens hostage. The Israeli death toll has exceeded 1,200 at the time of writing, while over 1,000 Palestinians have been killed in Israel's retaliatory air strikes.

Royal College of Music professor suspended after misconduct allegations

Mark Messenger, a senior professor at the Royal College of Music (RCM), has been suspended after complaints were received about his behaviour. The RCM is one of the UK's most prestigious conservatoires, and is nestled between Imperial's Royal School of Mines and the Bone Building, on Prince Consort Road. The Times reports that Messenger denies wrongdoing. Sources who spoke to the newspaper claim there is a code of silence about alleged wrongdoing. The RCM said it had launched an independent, external investigation following the complaints, and that it could provide no further comment while that was ongoing. "The welfare and development of our students is central to [us]", said a spokesperson for the conservatoire.

We are always looking for story tips – whether that be changes on campus or serious cases of injustice. You can contact us by emailing felix@imperial.ac.uk.

SCIENCE

Nobel Prize in Physics flashes new glimpse into attosecond science

Felix talks with Imperial's Professor Jon Marangos to discuss Nobel-winning attosecond science.

Science Editor

TAYLOR POMFRET

Science Writer

ANUBHA BAL

Three pioneers in attosecond physics, a branch of physics involved in light-matter interaction, have been awarded the 2023 Nobel Prize in physics for their groundbreaking work probing how the tiny constituents of atoms, electrons, move within their atomic home.

The Lockyer Chair of the Physics Department at Imperial College London, Professor Jon Marangos, is a specialist in measurements at attosecond timescales. With a lecturing stint at Imperial spanning over 25 years, we couldn't resist sitting down with him to pick his brain about his field of expertise, which has this year been awarded the Nobel Prize in Physics.

Ultrafast physics

Professor Marangos characterises the length (or lack thereof) of an attosecond by comparing it to a human heartbeat. He explains that there are around “ 10^{18} heartbeats in the history of the universe” and that there are “ 10^{18} attoseconds in one heartbeat”. Attosecond science is vital for investigating small physical phenomena with impressive resolution. These include atoms, molecules, and electrons in matter. This demands that photon pulses used to probe the phenomena should be on the order of attoseconds.

Imperial College is home to the Blackett Laboratory Laser Consortium, where Professor Marangos is direc-

tor. The aim of the ‘Attosecond Electron Dynamics in Molecular and Condensed Phase System’ project is to investigate and create methods – both theoretical and experimental – to probe the behaviour of molecules and condensed matter.

Nobel winners

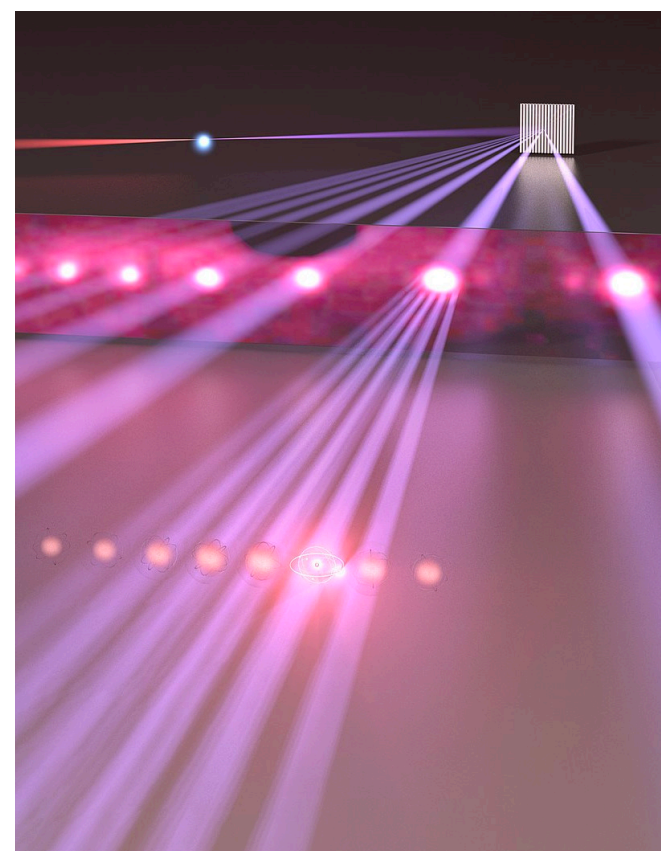
The first key breakthrough in attosecond physics came in 1987, when one of the three winners, Anne L’Huillier and her colleagues at Lund University discovered that an infrared laser shone through inert, noble gases produced light that contained unusually short bursts with constant intensity. L’Huillier laid the mathematical frameworks of this effect, which set the scene for future research in refining this strange light source and probed its use to produce attosecond light pulses.

Marangos explains, “Anne’s results really showed a characteristic phenomenon, which is this extended plateau. Suddenly you have this broad band light source with relatively balanced amplitudes across all the frequency components. And so L’Huillier was one of the first people to realise in principle that you had something you could use to synthesise a very short pulse, because the bandwidth theorem tells us that the frequency bandwidth, multiplied by the time duration, is limited by a number on the order of one. If you want to have a very short time duration, you have to have a very large frequency bandwidth.”



It’s great that the Nobel Prize exists because I think it does showcase and highlight science, but like everything, it has its flaws.

Following L’Huillier’s results, ideas in the field of attosecond pulse duration began to develop throughout the 90s, with the first demonstrations of attosecond pulse duration being intimately related to radical developments in laser technology, such as mode locking and light-pulse duration measurements. This made it



JILA’s extreme ultraviolet (EUV) frequency comb. The light source is a pulsed infrared laser, which is used to create a train of attosecond-long pulse bursts at EUV wavelengths. JILA

possible to probe how atoms move in a molecule, and in particular the opportunity to study transition states in chemical reactions. Studying these states through ultrafast lasers won the father of femtochemistry, Ahmed Zewail, the Nobel for Chemistry in 1999.

In 2001, the two other winners, Ferenc Krausz of the Max Planck Institute of Quantum Optics and Pierre Agostini at Ohio State University both independently developed techniques building on L’Huillier’s work to finely produce attosecond pulses and thus control how long they lasted.

“The first demonstrations of attosecond pulse duration were pioneered both by the group of Pierre Agostini in France and by the group of Frank Krausz working in Hungary. Pierre Agostini, even before Ann discovered high harmonic generation, discovered a phenomenon called Above-Threshold Ionisation, where you see electrons acquiring excess photons above the energy they need to just ionize. This shows up in an electron spectrum as a series of peaks, which are closely related to the harmonic peaks that you see in a high harmonic spectrum. So Agostini had already been very much a founder of the field back in the 70s. He then went along and developed the reconstruction of attosecond beating by interference of two-photon transitions technique – also known as the RABBITT technique – in 2001 to confirm that in ordinary high harmonic generation, you are making a train of attosecond pulses. While – what Frank Krausz did – really advanced laser field engineering, instead of having a laser pulse that has multiple cycles which would drive a pulse train, he made a pulse that was very short in duration – it had just a couple of optical cycles. The trick was then to stabilize the phase of that electric field. Krausz was a master of this early on,

to the point that his team could generate and measure isolated attosecond pulses with some accuracy. That is the reason that L’Huillier, Agostini and Krausz won the Nobel Prize for their pioneering work.”

“This is something really to celebrate. It shows that we are working on something that the Swedish Academy recognises as being important. I think it’s recognition of a broader community as well.” Marangos commented.

Nobel reflections

Professor Marangos raised a meaningful point on community: physics research is often done in large scale with multi-colaborative working groups. We asked Professor Marangos whether the Nobel should recognise these groups, rather than individuals.

“In a sense, I hope it does. Though, one of the things that gives it its cachet, is the fact it’s so exclusive and so hard to win one, and if you made it more of an award to a whole field it would lose that sort of shine. The role it plays in showcasing and highlighting science is significant enough that this current model is the one that will persist. We live in an imperfect world and maybe this is actually the best way forward with Nobel Prizes as they really do catch the public imagination.”

Like every prize, the Nobel has flaws and is subjective. “Even in the unfairness as well – and let’s be honest there were some terrible unfairness, Anne was only the third physics Nobel Prize winner in the last 50 years 1973-2023 who was a woman. There were two others just immediately before. In fact, Donna Strickland, who won the Physics Nobel Prize in 2018, was the first woman to win it since 1963, with Andrea Ghez following shortly in 2020. Nevertheless, it’s good to see that this sort of mental block on the part of the committee has been overcome.”

Sir Tom Kibble, who was a prominent Professor of theoretical physics at Imperial College, helped discover the Higgs mechanism, named after Peter Higgs who won the Physics Nobel in 2013. The Higgs mechanism explains why particles have mass. Kibble never received a Nobel in Physics, despite the consensus among his colleagues, like Marangos, being that

he deserved one. Kibble’s research was at the root of three seminal discoveries, including the Higgs Boson, that earned others the prize.

“I think for many of us it was a great disappointment that Tom did not win the Nobel Prize. The way I’d always understood it, the Higgs Boson was the Higgs-Kibble particle and unfortunately history moved on so quickly that some of the early contributions were forgotten. That happens in every field, it may have happened here too. But nevertheless, that’s the way of the Nobel Prize. There are certain rules, one of which is that only three people can be awarded the prize. So if you’re the fourth person you will lose out, and that’s sad, but those are the rules. The Nobel Prize is an imperfect construct, let’s be clear. It’s great that it exists because I think it does showcase and highlight science, but like everything it has its flaws.”

The Nobel in Physics was a great win for the attosecond physics community, of which Professor Marangos is a prominent member. Marangos personally met two of three winners, Anne L’Huillier and Pierre Agostini, at the Attosecond Science and Technology symposium in Sweden, this August.

“It was a great symposium - it was quite a small gathering with only about 30 of us giving talks. I think it highlighted how to think about the contributions that were made led to the prize. Two of the prize winners were there. Pierre Agostini, I think, couldn’t come because he was with his grandchildren.”

“It wasn’t just about the initial breakthroughs. It was also about the current state of the field and where it’s going. One of the things that’s most impressive about the field is how it’s diversified so much in terms of the scientific problems it’s turned its attention to. I think from ultrafast electronics, to ultrafast chemistry, to ultrafast quantum processes in materials – which looks like a field that will continue to be very influential. In essence, it’s about the dynamics of electrons in matter. And that’s clearly an underpinning subject for so much of physical science.”

2023 PHYSICS NOBEL: MEETING THE WINNERS



Collage of 2023 Physics Nobel laureates, from left to right: Anne L’Huillier, Pierre Agostini, Ferenc Krausz. Taylor Pomfret

Anne L’Huillier – Lund University

Anne L’Huillier is a French-Swedish physicist, and professor of atomic physics at Lund University in Sweden. She is the leader of an attosecond physics group which studies the dynamics of electrons in real time, and is used to understand the chemical reactions on the atomic level. Anne L’Huillier obtained her PhD from the Université de Paris VI in France. After undertaking postdoctoral research in Sweden and the USA, she spent the years 1986–1995 as a researcher at the French Atomic Energy Commission. She then transferred to Lund University, where she has been Professor of Atomic Physics since 1997. She works with state-of-the-art lasers. Anne became the fifth woman to receive the Nobel in Physics, for her work on higher harmonic generation in noble gases, which generate ultrashort ultraviolet pulses.

Pierre Agostini – Ohio State University

Agostini earned his doctoral degree from Aix-Marseille University in 1968. He then became a researcher at CEA Paris-Saclay and held positions at the University of Southern California, FOM Institute for Atomic and Molecular Physics in Amsterdam, and Brookhaven National Laboratory in the US. Agostini and his group first demonstrated attosecond pulse duration, and doing so, discovered Above-Threshold Ionisation. Agostini has been a founder of the field since the 1970s. In 2005 he joined Ohio State University where he is currently based.

Ferenc Krausz – Max Planck Institute

Krausz was born in Mór, Hungary, in 1962. He studied theoretical physics at Eötvös Loránd University, graduating in 1985. After a stint as a researcher at Budapest University of Technology and Economics in 1988, Krausz moved to Vienna University of Technology where he held various positions. Krausz won the Nobel for his work in laser field engineering. Instead of having a laser pulse with multiple cycles forming a ‘pulse train’, Krausz was an expert in making pulses that were very short in duration – with just a couple of optical cycles. His team generated and measured attosecond pulses to some accuracy. In 2004, he became a director of the Max Planck Institute for Quantum Optics in Munich.

ENVIRONMENT

Meet your Ethics and Environment Officer, Yuxi Liang

Environment Editor
SIMRAN PATEL

As Imperial College begins the third year of its Sustainability Strategy, its 105th place ranking in the People & Planet University League stands out. Felix speaks to Imperial College Union's Ethics and Environment officer, Yuxi Liang, about her plans to improve this ranking.

Why does sustainability matter to you?

To me it means that what we have now, we can use for a long time and not have too much waste. I read in the news about an American girl who studied environmental science, and what was the waste in her life? In four years, only enough to fill a glass bottle. I think that set an example for me to reduce waste and recycle more things in my life.

What are Imperial College Union's three most unsustainable aspects, and what are your plans to improve them?

1) The canteens.

We can use our own coffee cup to buy coffee, but we can't use our own lunch boxes to buy our lunch. One thing I want to do is encourage students to buy lunch or dinner like how we buy coffee – we can bring our own lunch boxes. We will see if we can reduce the price of food on campus a little, because they then save on packaging costs. Another thing I want to see is if the canteen can give students different portion sizes – because for some, one plate of food is too much.

2) Waste.

I want to promote the use of digital screens instead of paper – but this depends on how everyone feels, because I see a lot of students want to print lecture notes. I want to not only promote digitalisation, but let students know how much carbon they will reduce if they reduce printing. We also want to add more paper recycling bins and let everyone know like what kind of paper goes into these bins. I will also promote the use of recyclable bags and bottles.



Student-run liberation and community networks at Imperial. Imperial College Union

3) Electricity usage.

I want to reduce unnecessary lighting and power on campus day and night. There are some lights where if people are in the room they turn on, but if not then they turn off. I'm not sure if these lights are in every building – but if this is the situation, that's good.



I want to not only promote digitalisation, but also let students know how much carbon they will reduce if they reduce printing.

Could you explain more about the “student environmental complaint mechanism” that you wish to implement – how would that work?

If students have any ideas, send this to me. And I will say whether we have enough resources to implement their ideas ... I think I plan to do this in a form, because when I ask something verbally then people can't think about it much. I have icu-environmental@imperial.ac.uk for everyone to send emails to me to give any suggestions or any changes they want to see. I also want to host events

with student groups and cooperate with other groups – maybe Imperial Climate Action. I had a chat with them before – they have lots of ideas, lots of data.

You mention on your Union webpage that you are a big fan of travelling. Do you think the Union should have a sustainable travel policy?

I didn't think too much about this before last month – but now I think about this a lot. If you can choose train or ship, you should. And have a basic plan to for the future – that way you can have a long trip meaning you only need to travel once. I know there are some conferences in different places that have different dates. I don't have a very good idea now, but ... maybe I can make this more clever. We can save money and save carbon.

Have you planned any College-wide events relating to environmental awareness or action?

I have Sustainability Week next semester, and for this semester I'm still planning to do something around COP28.

And finally, on a light-hearted note, do you have a favourite organism? Animal, plant, or something else?

My favourite animals are cats because my best friend has one cat.

Do fossil fuel companies have a place in the Science Museum?

Felix investigates the presence of fossil fuel companies at the Science Museum.

**Environment Editor
SIMRAN PATEL**

Pressure is growing for the Science Museum to cut ties with the fossil fuel companies that currently sponsor its exhibitions. BP sponsors the museum's educational wing and Shell, Equinor, and the Adani Group have sponsored its exhibitions in the past. Campaigners believe it is hypocritical for exhibitions about science and climate change to be funded by these organisations which have historically spread misinformed science and are contributing disproportionately to the climate crisis.

Why are the Science Museum's fossil fuel partnerships controversial?

BP is a founding partner of the Science Museum Group (SMG)'s STEM training academy, which provides training and resources to those working in science communication and education. The company also supported the Enterprising Science initiative – which encouraged young people to engage more with science – alongside the SMG.

“BP has been investing in education for more than 50 years, working to address the UK STEM skills gap and contributing to every stage of education”, said David Nicholas, Vice-President of Media Relations for BP. “We are proud to have partnered with the Science Museum Group, King's College London, and UCL Institute of Education on the pioneering ‘Enterprising Science’ research project in 2013, the success of which led to the creation of the Science Museum Academy of

Science Engagement in 2018.”

BP's involvement with science outreach also goes further back than this. In the mid-1990s, its *What makes weather?* documentary aimed to explain the consequences of burning fossil fuels for schoolchildren. Despite knowing these consequences, BP was, until 1996, a member of the Global Climate Coalition – a lobbying group which tried to discredit climate science and campaigned against policies to reduce greenhouse gas emissions. BP continues to be accused of delaying climate action today. Critics have, for example, pointed to the oil giant's recent

scaling back of its expected carbon emission reduction from 40% by 2030 to 25%.

“BP is transforming into an integrated energy company”, explained David, “and while we are still mostly in oil and gas today, we are increasing our global investment into lower carbon and other transition businesses – this rose from around 3% of our total investment in 2019 to 30% in 2022. We aim for this proportion to reach 50% by 2030.”

Shell sponsored the Our Future Planet exhibition about carbon capture and storage, which ran in the Science Museum from May 2021 to September 2022.

Channel 4 News reported that the contract included a ‘gagging clause’, meaning the museum could not say anything that damaged Shell's reputation. The Science Museum's Atmosphere exhibition about climate change, which closed in March 2022 after 12 years, was also sponsored by Shell. According to a 2015 article in *The Guardian*, Shell representatives tried to influence the content of this exhibition.

“We fully respected the museum's independence,” said Paul Connolly, Shell's media spokesperson. “That's why its exhibition on carbon capture mattered and why we supported it. Debate and discussion – among anyone who saw it – were essential. There was no question of us trying to restrict this.” A Science Museum



Simran Patel and Shadowssettle CC BY-SA 4.0

um spokesperson said, “At all times the Science Museum retains editorial control of the content within our exhibitions and galleries, and this is asserted clearly and unambiguously in all contracts we sign.”

In the 1990s, Shell produced a documentary called *Climate of Concern* warning the public about the effects of climate change – while being a founding member of the Global Climate Coalition. “The Shell Group did not have unique knowledge about climate change,” said Connolly. “The issue of climate change and how to tackle it has long been part of public discussion and scientific research for many decades. It has been widely discussed and debated ... Our position on the issue has been publicly documented for more than 30 years, including in publications such as our Annual Report and Sustainability Report.”

Activists claim Shell continues to delay climate action, even after the Coalition’s dissolution. Earlier this year, it U-turned on plans to reduce annual oil production by 1 to 2% per year, instead announcing that production would remain stable until 2030. “It remains our view that global energy demand will continue to grow and be met by different types of energy – including oil and gas,” said Connolly.

Equinor currently sponsor the Science Museum’s Wonderland gallery, consisting of interactive science exhibits. According to *The Guardian*, this contract also included a ‘gagging clause’. The Norwegian oil company has come under fire over the new Rosebank oil field in the North Sea, which was recently approved by British regulators. “We are still in contract with the museum and title sponsor of Wonderlab: The Equinor Gallery,” said Alice Baxter, media spokesperson from Equinor.

However, most of the recent outcry about the Science Museum has been about the Adani Group. Adani is a company within the Indian conglomerate – whose diverse operations include coal mining and thermal power plants – is sponsoring a Science Museum exhibition. From early 2024, Energy Revolution: The Adani Green Energy Gallery will display the latest climate science and technological solutions to combatting

the climate crisis. Science education is not new to the Adani Group – its community engagement wing is educating thousands of students in India. However, activists believe Adani’s educational initiatives do not excuse the environmental and ethical violations that other companies in the Adani Group have conducted. For example, the Group operates coal mines in India, Indonesia, and Australia – some of which are on indigenous land.

Even Adani Green, a renewable energy company and title sponsor of the Science Museum exhibition, has not escaped without scrutiny. Their solar power plants in India have been accused of displacing farmland and using too much freshwater. Many of the environmental and human rights abuses Adani Group have carried out were mentioned in the Science Museum’s own due diligence report in 2020 – but this report seems to have been ignored or circumvented by claiming to partner only with Adani Green. However, a report by the research firm Hindenburg challenges the independence of Adani Green from the Group’s coal mines. The Adani Group did not respond to our request for comment.

How has the Science Museum replied?

The SMG has signed up to the Science-Based Target Initiative, which tracks companies who have committed to the goals of the Paris Agreement. Their direct carbon emissions have fallen by 69% since 2011/12, and they aim to be net-zero by 2033. As of 2022, the SMG also asks for partners to be on track to meet Paris Agreement climate goals by the end of March 2024, which they are assessing using the Transition Pathway Initiative. This initiative has given the decarbonisation pathways of BP, Shell, and Equinor the best possible classification – despite itself reporting in 2020 that no fossil fuel companies are on track to meet these goals.

“External funding has been vital to the transformation of our five museums”, said a Science Museum Group spokesperson, “creating inspiring, free spaces where millions of visitors can immerse themselves in authentic stories about science, engineering, mathematics, and

BP

- STEM outreach initiatives have reached around 2.8 million British students over the past five years.
- One of the first oil and gas giants to announce ambitions for net zero by 2050, and one of the only ones to have emissions reduction targets covering the Scope 3 targets.
- Supported biodiversity projects in Georgia, Turkey, and Trinidad and Tobago.
- Developing three offshore wind farms in the North Sea and Irish Sea, and constructing a solar power plant that should power around 14,000 homes.
- Spent 97% of its investments in fossil fuels and generated 0.17% of its energy from renewable sources in 2022.
- Lobbied against restrictions on methane emissions in the United States in 2019.

Shell

- Encourages 14-16 year old girls to pursue careers in engineering, and funded a workshop which has trained over 215,000 students in engineering skills.
- Aims to reduce operational emissions by 50% by 2030 compared to 2016 levels, and the net carbon intensity of its energy products by 100% by 2050 with the same baseline. They also aims for net-zero by 2050.
- Its customers can pay extra to offset the carbon emissions from their fuel – investing in projects in Scotland, Peru, Indonesia, and Guatemala.
- Made nearly \$40 billion in profits in 2022 – the highest in its history – and is expected to pay little to no tax on it.
- Spent 91% of its investments in fossil fuels and generated 0.02% of its energy from renewable sources in 2022. “We are planning to invest \$10-15 billion across 2023 to 2025 to support the continued development of low-carbon energy solutions including biofuels, hydrogen, electric vehicle charging, and CCS,” said a Shell spokesperson to *Felix*.
- In 2021, a Dutch court ruled that Shell needs to cut carbon emissions from oil and gas by 45% from 2019 levels by 2030 – for violating the European Convention on Human Rights.

Equinor

- Pledged net-zero emissions by 2050, aiming to make 40% reduction in net carbon intensity by 2035.
- Around 1 million homes in Europe are powered by Equinor’s offshore wind operations.
- Earned a record-breaking £62 billion in 2022.
- Aside from Rosebank, Equinor has plans to expand oil production in Canada (Bay du Nord), Brazil (Campos Basin), and Argentina (Agerich-1).

Adani Group

- Provides over 75 skills training courses to Indians and allows Indian students to visit Adani Group projects. The Foundation also provides free schooling to over 3000 students – and subsidised education to over 6500.
- Invested the equivalent of \$3 billion in making Mumbai’s electricity more sustainable.
- Planted over 3000 hectares of mangroves, and conserved over 2300 hectares of mangroves, in the state of Gujarat in India.
- Owns many coal mines and power plants – notably the controversial Carmichael mine in Australia.
- Research firm Hindenburg accused the Group of “stock manipulation and accounting fraud”.

more ... We continue to urge companies in carbon-intensive sectors to show more leadership in speeding up the transition to low-carbon energy sources.”

What resistance have the partnerships faced?

Over the last four years, activists have protested at the Science Museum over its fossil fuel partnerships. For example, UK Student Climate Network spent the night in the Science Museum in October 2021, and Extinction Rebellion put up a banner inside the museum during the Great Exhibition Road Festival earlier this year. Recently, 100 people from Climate Choirs walked through the Science Museum, singing in protest of fossil fuel sponsorships. These demonstrations have been supported by resignations of two of the Science Museum Group’s trustees and vocal condemnation from former UK Chief Scientific Advisor Sir David King. Speakers have also pulled out of the Science Museum’s ‘Climate Talks’ series over these partnerships.

In 2021, academics and science communicators signed an open letter pledging not to work with the Science Museum until the controversial sponsorships are dropped. Dr Dave Clements, Reader in Astrophysics at Imperial and one of the signatories of the open letter, said he was “very disappointed” in the Science Museum. “It’s clear that ... the current management and board of directors are more worried about money than, frankly, the science” Dr Clements said. “Despite being asked to contribute to [a recent Science Museum exhibition], I could not because they have not changed their policy on sponsorship. I would advise all my colleagues to withdraw their support from similar events and tell the Science Museum why.”

The Science Museum is one of the few remaining British arts institutions that still partners with the fossil fuel industry. The British Museum, Royal Opera House, and National Portrait Gallery all ended their partnerships with BP earlier this year. In 2019, Royal Shakespeare Company terminated BP’s initiative to provide subsidised tickets to young people wanting to see their plays.



Science Museum, Exhibition Road. Shadowssettle

He’s not all bad: Sunak pushes through anti-smoking policies

Deputy Editor
ZANNA BUCKLAND

In an announcement by PM Rishi Sunak on Thursday 5th October, the UK government is planning to combat nicotine addiction with a law stating that “children aged 14 or under this year can never legally be sold cigarettes in their lifetime”. The government aims to implement this by increasing “the age of sale...by one year each year” from 2027. This means that in 2027, the legal age for buying cigarettes will become 19, in 2028 it will become 20, and so on. If the ban is successful, it might also prove to be a win for the environment in the long run – discarded cigarette butts are claimed to be the most littered single-use plastic product in the world.

Two major criticisms of the policy proposal are the possibility of it perpetuating the illegal trade of cigarettes and other tobacco-based items on the black market and that it takes away people’s freedom to choose whether or not to smoke.

Sunak also mentioned plans for discouraging vape use among younger generations – particularly schoolchildren. Vapes are heavily targeted towards young people, with their bright colours and various flavours. Proposed regulatory procedures for this include restrictions on where vape products can be displayed in stores and restrictions on targeted marketing.

On the same basis as Sunak’s newly announced smoking policy, the potential for a ban on single-use vapes was floated around by multiple major news outlets last month. Ultimately the policy didn’t come to fruition. One challenge in banning single-use vapes is their usefulness for smokers who are trying to transition away from cigarettes. Many students probably also wouldn’t have been happy about the ban, but it would have proven beneficial to the health (and wallets) of those who only purchase the disposable version of the product.

Banning disposable vapes would have similar environmental benefits to banning cigarettes. Vapes contain a variety of materials (plastics and metals) that cannot be recycled together and that have extremely slow degradation rates. Some of the electronic materials could last longer than a vape pen is used for and might be better utilised in products with longer lifetimes. Additionally, vapes leach a myriad of waste products on dis-

posal; microplastics from the casing, heavy metal lithium from the battery, and carcinogens, not only toxic to humans but to lots of other wildlife, not to mention the nicotine itself. On several occasions I’ve seen vapes left in the grass in Hyde Park and on pavements – both toxic and a visual blight.

This summer, many music festivals implemented single-use vape bans in efforts to protect the lands being used and adjacent environments. This sounds great in theory, and some vapes were confiscated upon entry to these festivals, but – at least at Glastonbury Music Festival – bag checks weren’t nearly thorough enough to be effective. It should also be noted that at Glastonbury, single-use vape pens could still be purchased at on-site stalls along with biodegradable wet wipes (wet wipes were also on their list of banned items, for environmental reasons). These products join the collection of discarded items that get left on the grounds by festivalgoers for clean-up crews to deal with. The fields that hosted these events probably remain littered with single-use vapes – that is, if they haven’t been washed or carried into neighbouring ecosystems. A country-wide ban might be the only way to ensure this doesn’t continue to happen at future events.

The cigarette policy is a slow-moving one; it won’t take effect for another four years and is already facing public resistance and criticism. However, it appears to be a solid step in the right direction. I only find it unfortunate that this assertion doesn’t seem to extend to policies solely focused on environmental protection; perhaps a more poignant human health risk is necessary to warrant decisive action from ministers? Regardless, progress is progress, and the planet will appreciate all the wins it can get, however major or minor.

Stay tuned! Next week I plan to discuss in more detail the implications and reasoning behind Sunak’s rolling back of climate-forward policies.



COMMENT

Why university education should be reformed – and how to do it

Imperial takes a page out of Orwell's book with recent developments

Comment Writer

CONSTANTIN KRONBICHLER

This year, my department introduced a stricter way of checking attendance through the use of an app called My Imperial Campus. It uses Bluetooth to check whether students are physically present for lectures and for labs. The reason for its introduction is student well-being. Not showing up will make someone reach out to you. At first, this may seem like a good idea. In reality, this is just one more step away from the principles on which the very first universities were founded.

To understand where universities are heading, we must investigate their past. The first Western universities, founded in the Middle Ages, were located in Bologna, Paris, and Oxford. According to the National Gallery's Glossary they taught the seven liberal arts: grammar, logic, rhetoric (the core subjects known as the trivium), arithmetic, geometry, astronomy, and music (quadrivium). These were

named the "free" arts (from the Latin word *liber*, meaning free) because learning about them made students free, independent individuals.

The next big step was the German university reform in the early nineteenth century. It was initiated when Wilhelm von Humboldt, an educational theorist and philosopher, set up the Berlin University. For the first time, the concept of lecturers who were equally important as researchers was introduced. Moreover, students were granted a lot more freedom to engage with the topics they were interested in, all centred on the liberal arts and classics. At a time when French universities were heavily restricted by the state, this line of thinking was revolutionary, and was later adopted by most universities.

By this time, the age of industrialisation had begun. It had big consequences for the workplace and the structure of society. Over time, more and more skilled workers were required. A process of specialisation started, which would later trickle down to universities. We re-



Students will be severely detrimented by Imperial's approach Elif Civelekoglu

alise this very clearly when comparing, for example, the degree of specialisation between subjects such as electrical engineering and the seven liberal arts.

The other development brought on by industrialisation was the creation of a growing middle class that could afford higher education. According to *The New Statesman*, in the 1970s and 1980s about

there, it derives how universities should be optimized. This development is exactly what sociologist George Ritzer predicted when introducing the term McDonaldization (for those interested, read *Beyond McDonaldization – Visions of Higher Education*, edited by Dennis Hayes, which applies the concept of McDonaldization directly to education). Ritzer states that



This is just one more step away from the principles on which the very first universities were founded.

15% of students went to university while more than half do now (50% of people between the ages of 30 and 34 have a degree).

So, how have universities changed over this period? In the UK, the transformation began with the Jaratt report from 1985. The British university system is known for treating universities as companies, and students as customers. From

rationalisation and economisation processes will eventually transform all aspects of our lives according to the principles of businesses like McDonald's: efficiency, control, calculability, and predictability.

These have led to the new university structures, as they enable massification and increase benefits for the economy. Efficiency in the case of universities means

designing institutions that can take on more students with little extra cost.

Control refers to monitoring progress towards certain targets, and thereby eliminating degrees of freedom for students and staff. This explains the trend towards attendance checks for student control. Staff control is exercised using Academic Workload Planning (AWP) which determines the exact number of hours for an academic working year divided in lecturing and research time. Calculability refers to data collection and using that data for example in rankings which as we all know are ubiquitous in higher education.

Predictability refers to narrow learning objectives that do not leave room for free thinking (this applies a little less to STEM subjects that are taught at Imperial since they do not always have such open-ended questions).

Predictability can also be observed by looking at university websites or flyers.

They are usually very similar in their approach to stylising what personality traits their graduates have: innovative, leaders, social, global citizens, etc. Like McDonald's aims to produce the same burger over and over, universities aim to produce students sharing the same personality traits.

The problem is that this does not happen through the self-enlightenment of students via critical thinking but rather by declaring definitive university-wide values which must not be questioned, skipping an important step in the students' path towards becoming independent universal thinkers.

So why is this development not desirable? From a purely rational and economic point of view, the new university model seems to be the ideal solution; more specialised workers are required, and students should finish their degrees as quickly as possible to join the workforce earlier. Universities like Imperial successfully offer these kinds of vocational courses the industry wants.

Our society should not, however, be measured only by its economy, but also by the beliefs and ideals of individuals. Treating students like products coming off a university assembly line with certain desired traits is a dehumanising experience. Assuming that this will leave

students' psyches unaffected is naive.

The 'assembly line' framework does not allow students' thinking processes to take on an individual shape. For this, a student must quench their thirst for



The act of treating students like products that come out of the university assembly line with certain traits is a dehumanising experience

knowledge in their own way. University is not about knowledge for knowledge's sake anymore. Rather, knowledge is a means to an end. It is fuel for the economy.

This prevents students from acquiring the ability to think freely, critically, and independently. While this lost potential of self-discovery is not important for a thriving economy, it is vital for a democracy of individuals.

So, how can universities be transformed for the better without a negative impact on our dear economy?

While this might be very unpopular, especially at STEM universities like Im-

perial, the only way to enable students to become responsible, free citizens is by including the study of the liberal arts in university education.

As John Henri Cardinal Newman said in his 1852 lectures on The Idea of a University, it is only by exposing students to the best that has been thought and said, can they obtain the ability for independent judgement. Hence, I suggest that STEM courses should reduce depth

on the technical side a little and add liberal arts modules. This could be done at the Bachelor's level. At the Master's level students can specialise in greater depth, which might require a Master's degree that is longer than a year. To make higher education affordable, tuition fees should be lowered. This should be combined with more freedom regarding the modules or lectures students attend so that the final degree is only determined by which exams students signed up for and passed. (To what degree students should be free to pick and choose would require a separate discussion).

In this way, students still gain a technical education while also having time and freedom to explore who they are as an individual.



Imperial treats students as money banks first, and learners second. Mike Buzadji

ARTS

Rising stars and seaside serenades



Captain Balstrode (Simon Bailey) and Peter Grimes (Gwyn Hughes Jones). Tom Bowles

A review of ENO's production of *Peter Grimes*.

Arts Editor
GILBERT JACKSON

The English National Opera presented the perfect reimaging of Benjamin Britten's psychological opera *Peter Grimes*, with masterful direction by David Alden, expert set design by Paul Steinberg, and an orchestra conducted by ENO's resident conductor, Martyn Brabbins.

Peter Grimes presents the hardships and misfortunes suffered by the lone-

some Suffolk fisherman, the character Peter Grimes, and the callous nature with which idle town gossip plays in the title characters eventual downfall. Paul Steinberg's set is a testament to minimalism done correctly; the set itself is grey and bare, with few elements in any given scene. The effect of this adds to the story beautifully, reminding us that, despite the onslaught of wit and slapstick comedy throughout the opera (credits to the direction of David Alden), there is an underlying psychological emptiness and loneliness felt by our titular anti-hero.

The role of Peter Grimes was to be played by Gwyn Hughes Jones, however Jones had suffered a cold and so was replaced by John Findon whose most recent performance was as the dwarf Mime in ENO's production of *Rheingold*. So far, John Findon has been seen playing secondary character roles in ENO productions, but after being thrown into centre

stage for this production of *Peter Grimes*, it is evident that ENO would be foolish to not use him as their go-to tenor lead in future. The role is still today one of the opera's most demanding. Findon gracefully assumed the position and was by far the brightest star that night; he cap-

praise. The sheer size of the orchestra and complexity of the music would present an arduous challenge to even the most seasoned conductors, yet Brabbins was unwavering in his direction and command of the orchestra. Clearly Brabbins added a shining quality to the music



It is likely that this production will not only be the highlight of ENO's opera season, but a highlight across their whole year.

tivated, enchanted, and serenaded us throughout the performance. With Elizabeth Llewellyn's beautiful performance as Ellen Orford, the two performers gave us an unstoppable dynamic duo.

Martyn Brabbins conducted the orchestra with keen skill deserving of high

in his interpretation. It is imperative that anyone who loves opera, and even those with merely a mild interest, should see this production in all its splendour; it is likely that this production will not only be the highlight of ENO's opera season, but a highlight across their whole year.



The full cast performing. Tom Bowles

MUSIC

Dancing into the year ahead

Investigative journalism at its finest: is Decibel any good?

Deputy Editor-in-Chief
ZANNA BUCKLAND

This year, with the reasoning that in starting my MSc I'm technically a fresher, I've taken it upon myself to attend as many Welcome clubbing events as I can stomach. The first of these was Imperial College Union's 'Heaven Takeover', at the famed gay club in Westminster – the first London club night I've been to since moving here three years ago. I've heard lots of great things about Heaven over the years, and it really lived up to its reputation. The venue itself is smaller than expected, but with the Imperial takeover it wasn't as packed as I'm sure it gets on its Thursday strip-show nights. The ability to take a breather

without having to step outside is a highly underrated element of an enjoyable night out. DJ guests included Karen Harding and Weaver Brothers, neither of whom I knew, but both were able to keep energy high and people jumping. We also bumped into a fair number of other fourth-years who were most likely also savouring their last year of freedom. The DJ in the upstairs room played bangers from all decades; a surprisingly good selection compared to other clubs I've been to in the UK.

All in all, Imperial x Heaven delivered an excellent first London clubbing experience, and was a really fun opening to the rest of Welcome Week; I'll definitely be back there soon!

I also attended Decibel's first event of the year (90's and 00's Bangers) in Beit



Colourful decor in FiveSixEight. Zanna Buckland

Quad – for those who don't know, Decibel is a recurring club night hosted by IC Radio throughout the year, usually spanning Metric, FiveSixEight, and the Union Bar. Again, I've never ventured into the world of Imperial clubbing prior to this week, and when we arrived at 10pm – only a drink or two in – to a completely empty Metric, I feared I had been right to avoid it. Fortunately, things did heat up once a few bigger tracks were played in sequence. *Moves Like Jagger, Pump It,*

and *Crazy in Love* were among the earlier successes of the night, and the Metric DJ was excellent with his transitions – a skill that is sorely lacking at most clubs I've been to but really elevates your experience.

The Metric space functions really well as a club environment and the open space of the Quad is great for when you need some fresh air and a sit-down. FiveSixEight and Union Bar didn't quite ramp up in the same way, with the music in the former being too quiet and the lights too high, while the latter became more of a retro games room, but Metric alone exceeded my expectations for a Union night – perhaps ACC and Slug will follow...

I confess that one of the highlights of my night was managing to grab a freebie VK-sponsored bucket hat (which will be washed) off the dance floor, despite not being one of the first 100 attendees of the night. I was also surprised at how many apparently sober freshers were happy to come up and start a conversation – kudos to them! – and was flattered to be mistaken for one of them on a couple of occasions. My next stop is the RCSU Autumn Ball this Wednesday, at The Steel Yard (although by the time you read this it will have come and gone); I hope to be as pleasantly surprised as I have been so far.



The DJ in Metric. Zanna Buckland

FILM

Sex, drugs, and the Prisoner of Azkaban

Film Writer

JONAH HEWETT

The world of *Harry Potter* is magical and fantastical, full of dragons, goblins, gnomes, witches, wizards, sentient art, funny hats, flying broomsticks, and wands. Every year a bunch of schoolchildren get put in some form of mortal peril, and every year a bunch of schoolchildren defeat the mortal peril with magical spells (the mortal peril is rarely treated as more noteworthy than the school quidditch tournament, or the house cup). *Y Tu Mamá Tambien* is a Mexican indie coming-of-age comedy-drama where two foul-mouthed teenage boys convince a beautiful older woman to accompany them on a drug- and alcohol-fuelled road trip to a beach (that they made up), both desperate to sleep with her, and she goes with them since her life had conveniently fallen to pieces the day before. Young director Alfonso Cuarón was just on the cusp of releasing *Y Tu Mamá Tambien* when he accepted the job to direct *Harry Potter and the Prisoner of Azkaban*, on the suggestion of Guillermo del Toro, who politely called him “fuckin’ flaco” by way of persuasion.

This seemed an odd choice. Chris Columbus, director of the first two *Harry Potter* films, had a pretty standard career of family friendly fare like *Home Alone* and *Mrs Doubtfire*. And there’s no doubt that he did a great job introducing the Wizarding World to the screen, laying the groundwork for the visuals of the world, and diligently guiding the acting of a cast of young, inexperienced actors. And the lighter atmosphere worked well for that cast, and that introduction. But the core of *Harry Potter* isn’t the spells, nor the wizards – it’s about growing up, going to school, and (as cliché as it is) the power of friendship in adolescence. And, as is frequently pointed out when the books are discussed, the stories and characters grew up in parallel to their audience. *Prisoner of Azkaban* comes at a pivotal time in the series, when the main characters enter their teenage years, and things begin to get darker, spookier, and a lot more nuanced. Columbus set the scene for the rest of the series; Cuarón set the tone.

The cinematography in *Y Tu Mamá Tambien* is great. The camera is handheld and shaky, at times almost lending a documentary quality – it feels real. Deep, considered shots provide us with a very personal view of the emotions of the char-

acters, and how others’ actions affect them. Use of the classic ‘Dutch angle’ allows us to infer more about the trajectory of the scene than we are told by its contents. In short, the cinematography is considered and character-driven. Cuarón brought this to *Harry Potter* too, and the result is a far more personal view of Harry’s world. The camera shakes with the movement of the train, moves fluidly through mirrors and windows, focuses briefly on tiny details like a quiver of the Womping Willow as it shakes off the last leaves of autumn. In the first two films, we’re introduced to the Wizarding World as an audience. In the third film, we’re in it. For a generation of young teenagers experiencing their own adolescent angst, this was perfect.

There’s a semi-famous story, told in the DVD extras of *Prisoner of Azkaban*. Before they started filming *Prisoner of Azkaban*, Cuarón asked each of the three main cast members to write an essay about their character. As the story goes, Emma Watson wrote out several pages, Daniel Radcliffe submitted one, and Rupert Grint turned up empty-handed. Give or take a few magical differences, the cast were living through almost the same adolescent experience as their characters. And, give or take a few narcotic differences (unless you count Butterbeer), a similar one to the protagonists of *Y Tu Mamá Tambien*. Cuarón’s experience of directing the latter film in part helped him to direct the most creative film in the *Harry Potter* series, and one of the most emotional ones. It paved the way for creativity in the later films too; for all its faults, the series has a consistent respect for filmmaking that you just don’t see in other similar franchises.

On a final note; if you’re interested in further (and much better) analyses of the filmmaking triumphs to be found in the *Harry Potter* films, the YouTube channel *Nerdwriter1* has two excellent videos about *Prisoner of Azkaban* and the brilliant sound design evolution throughout the series.



Mike Buzadji

BOOKS

Genre-transcending writer, Jon Fosse, wins Nobel Prize in Literature

Norwegian playwright, novelist, and poet lauded for his intimate, vulnerable oeuvre.

Books Editor

MOHAMMAD MAJILSI

The 2023 Nobel Prize in Literature was awarded to Norwegian Jon Fosse, aged 64, for, as quoted from the Swedish Academy, “his innovative plays and prose which give voice to the unspeakable”. With a ca-

reer spanning 40 years, starting with his first prose novel *Raudt, svart* (*Red, Black*) published in 1983, Fosse has developed an impressive oeuvre bound together by themes that are painfully, beautifully human.

Writing in the Norwegian standard ‘Nynorsk’, Fosse has the honour of being the most-performed Norwegian playwright, and one of the most-performed playwrights globally after his primary inspiration Henrik Ibsen. Oth-

A Guide to Jon Fosse

Novels

The Boathouse, 1989
Melancholy I-II, 1995-96
Aliss at the Fire, 2010
Scenes from a Childhood (short story collection), 2018
Septology, 2022
A Shining, 2023

Plays

Someone is Going To Come, 1992
Nightsongs, 2022
I Am the Wind, 2012

Poetry & Essays

Poems, 2014
An Angel Walks Through the Stage: and other Essays, 2015

er inspirations include authors Samuel Beckett, George Trakl, and Thomas Bernhard, as well as the religion of Christianity.

Part of the appeal of Jon Fosse is his ability to capture the essence of living in such eloquent detail: common themes in his work include ambiguity, the passage of time, faith, and struggle, all brought together against the primordial backdrop of western Norway, where Fosse has lived for most of his life. Time passes in an instant, flowing like memories, and his stories focus on simple living and fishermen.



An impressive oeuvre bound together by themes that are painfully, beautifully human.

Fitzcarraldo publishes Jon Fosse’s works in English, with translation completed by Damion Searls. Key works include *Scenes from a Childhood*, a collection of short stories; *Aliss at the Fire*, a novella about an elderly woman, her missing husband of 20 years, and loss and grief; the play *Someone Is Going to Come*, a tense, paranoid story of an isolated young couple who cannot shake the eponymous feeling; and finally, his magnum opus, *Septology*, an 800-odd page, 7-volume tale about an aging painter grappling with love, death, faith and hope.



Jon Fosse. Tom A. Kolstad

Please, someone, hand Miss Emecheta her flowers!

A story of arriving, sinking, and surviving in 1970s England.

Books Editor

FIYINFOLUWA T. OLADIPO

Continuing on from Issue 1827, we take another look at a book by a Black British author in celebration of Black History Month, this time placing a magnifying lens on one woman's experience arriving as an immigrant in 1970s England.

In the landscape of people forming the pantheon of post-colonial writers – Chinua Achebe, Doris Lessing, Ngũgĩ wa Thiong'o – oft less-mentioned are not those writing from a continent that is (as Chinua Achebe might put it) 'no longer at ease', but those writing from the other side of the trans-Atlantic equation. These are people writing from within the heart of their old colonial masters, where one might have likely received (as Buchi Emecheta puts it) 'a cold welcome'. It is of the latter group that Nigerian-born British novelist Buchi Emecheta is firmly planted, and who should be considered as the premier writer – a roaring tigress of her age.



Second Class Citizen describes her life [...] by way of a semi-autobiography.

Published in 1974, *Second Class Citizen* describes her life and the times enclosed, by way of a semi-autobiography. It spans her from her childhood in Nigeria, to her eventual marriage to the husband she would soon leave in England – Sylvester Onwordi (embodied by the character Francis in the novel) – and her time spent being condensed into the mould of the 'working-class immi-

grant'.

The novel is scandalous in many ways, serving to break apart the many delusions of Britain's colonial conquest, by outstripping the outrageousness of Britain's colonial conquest with its raw presentation of a post-colonial experience. This is a story of dangerous childminders, meningitis mistaken for malaria, and the various highs and lows of the motherhood of five children (and arguably, one husband) in less-than-desirable conditions. It is an outrageous novel because, for the most part, it is



As much as it is a damning narrative, it is also one of joy, hope, and faith.

true.

Emecheta achieves a feat that feels unique to this kind semi-autobiographical novel: it paints two portraits simultaneously. One is a candid description of her life growing up in Nigeria, the struggles of losing two parents, and achieving self-hood within the male-preferential terrain of Igbo culture at the time. The other paints a portrait of England, itself grappling with the tumults of the era, but for Emecheta and many others like her, a time of rapid condensation from their previous lives into the boxes available for them as poor and discriminated against in this new land.

"You must know," as Francis, the semi-autobiographical husband, says, "you may be a million publicity officers board before the Americans; you may be earning a million pounds a day; you may have hundreds of servants; you may be living like an élite, but the day you land in England, you are a second-class citizen." Roll credits.

But as much as it is a damning narrative, it is also one of joy, hope, and faith. The experience of an aspiring writer finding her way in a new world, finding her hopes and passions, and finding God, later becoming one of the



foremost Mike Buzadji / Penguin Books

writers on

the immigrant experience and an unmatched influence on the generations after her.

I have a list of names of people I plan to cajole into reading this book. Through a Black British lens, it reads less like a memoir than a manifesto (with its section titles like 'Learning the Rules', 'Applying the Rules', and so forth). But to a broader audience, curious about where to start in Black British Literature, here is a book serving up a beautiful education, about all the ways you need to mind the transatlantic gap, finding a faith in God, and, as Buchi Emecheta puts it, "the birth of [a] dream".

The latest from Zadie Smith



In lieu of last week's article for Black History Month, we take a moment to highlight Zadie Smith's newest novel, *The Fraud*: 'a dazzling novel about how in a world of hypocrisy and self-deception, deciding what's true can prove a complicated task'.

If you want to write for us at Books, get in touch at books.felix@imperial.ac.uk!

FOOD&TRAVEL

Last year's triathlon trips

Read as Charlie and friends describe their week-long summer tour in Club La Santa, Lanzarote

Travel Writer

CHARLIE LINDSAY

In November of last year during our autumn trip, ten of us made the hour-long train journey from London to my house in Kent, where my mum cooked meals for everyone – even for the vegans and gluten-free individuals. Then we did the local parkrun, some cycling and ate in a restaurant, where we narrowly avoided giving the gluten-free individual gluten. We even had time for some yoga, and I sent a photo of us doing Savasana, a form of yoga, to my sister with no context.

Summer Trip

Then on 18th September, 12 of us went to Club La Santa in Lanzarote, Spain for an unforgettable week of racket sports,

beach sports, sea sports and of course... triathlon sports. Club La Santa is a sports resort that has every activity imaginable: from an aqua party to

aqua jogging, badminton to beach volleyball, paddle tennis and paddle boarding (scan the activities QR code for the weekly schedule). The beach sports also included spike ball and

egg throwing. "What is egg throwing?" I hear you ask. I shall leave the explaining to the guy in the QR code video. All you



Activities schedule



Egg throwing

need to know is that Aidan and I won the egg-throwing competition by beating teams of kids and their parents. Go Team Imperial!

Many of us tried windsurfing, without participating in the 'Introduction to Windsurfing' activity because "we don't need no education". I saw that the trip-goers who arrived before me had been blown a mile out by the wind; as the group leader, I should have then taken a kayak out to rescue them, but instead thought "silly freshers" and then proceeded to also be blown out in need of rescue.

Every morning at 8am, we participated religiously in the cult-like activity known



The group in Spain at the resort Club La Santa. Charlie Lindsay

as 'morning gymnastics', in which hundreds of people surrounded the leisure pool to copy the moves of the cult leader (AKA 'Green Team Member').

In terms of triathlon sports, we attended morning open-water swims in the sea, ran sessions on the track and cycled up



The team riding bikes together during their summer tour. Charlie Lindsay

and down volcanoes at speeds of up to 86km/h, which wasn't on the risk assessment. On the last day, we cycled to the beach for ice cream and recreated the famous running-on-the-beach scene from

Steven and I played a mixed doubles tennis tournament in which you switch partners (AKA Swinger's tennis). Since we had more men than women, Steven was an honorary woman for the day and when he threw down a powerful serve, our opponents accused him of taking testosterone.

In the evenings, we played countless games of Spoons to dramatic classical music and played poker with Ritz crackers. By the end of the trip, we had all grown closer together, despite the many *Monopoly* deal rivalries.

Now, I know what you're thinking: "I don't like running!" or "I can't swim!" or "I can only cycle with stabilizers!", but we only ever do all three sports in sequence in actual triathlons! And most people in the club have never even completed a triathlon! So... if you want to join a friendly society and only come for social swim (which is mostly going to the sauna and the union), that's fine! And if you want your weekend to be filled with yoga on Friday evening, parkrun on Saturdays and a cycle in Richmond Park on

Chariots of Fire (scan the QR code to see the video).

We played all racket sports except for pickle ball (AKA budget tennis). My friend



Chariots of Fire

Sundays, join our WhatsApp, subscribe to our mailing list or better yet and buy our £25 annual membership, which is a steal because we missed the deadline to increase membership prices.

If you sign up to our mailing list, you will be able to sign up to the Autumn -Term trip taking place in November. Don't worry if you don't have a bike as we have four available to borrow. And who knows, maybe we'll go to Club La Santa in September 2024!



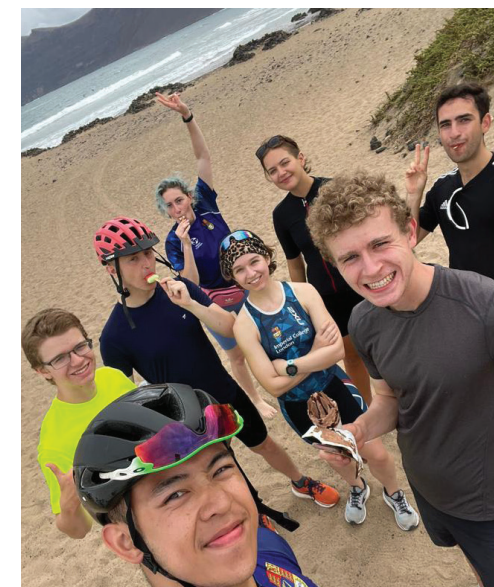
WhatsApp,
mailing list....



Post-run picture to commemorate the successful day. Charlie Lindsay



This team carry each other through thick and thin. Charlie Lindsay



Ice Cream at the beach before recreating the Chariots of Fire running scene. Charlie Lindsay

The beautiful, beneficial, bolstering broccoli

A defence of broccoli, an underrated vegetable worthy of more respect.

Food&Travel Editor
CHARLOTTE PROBSTEL

"I am on Team Broc!" said Filip. Ever since he learned how to steam broccoli in his first year of university, it has been a staple of his diet – and what an excellent choice that was. Broccoli and other cruciferous vegetables are known for preventing prostate, colorectal, lung and breast cancer – but how?

Glucosinolate

Glucosinolates, which give cruciferous greens their flavour, convert into isothiocyanates with the help of gut bacteria, which reduce activation of carcinogens,

increase detoxification, reduce apoptosis (cell death), reduce the number of DNA mutations and most importantly inhibit the growth of cancer cells.

In the *New York Times* bestseller, *How Not To Die*, Dr Michael Greger repeats the importance of broccoli so often, that it is not a surprise when he states that broccoli can reduce the chances of developing this or that type of cancer or lung disease.

Micro and Macronutrients

Broccoli is full of vital micronutrients such as Potassium (10%), Iron (6%), Vitamin C (150%) and Vitamin A (5%) (PICA) and has a solid balance of macronutrients. One stalk of broccoli, which is roughly three times the serving size, has 4.3g of protein, 0.56g of fat, 10g of carbohydrates (4g fibre, 2.5g sugars) and 51 calories. Broccoli is also filled with water, which keeps the body hydrated, has 0% cholesterol, 2% of the recommended daily intake of sodium, less than 1% of saturated fats and most importantly, it is very fun to eat. Broccolis are like little delicious trees.

How to Prepare

The first thing that any Chemistry stu-

dent knows is that if you add energy in the form of heat, you can transform A + B into C + D. Adding heat energy to food transforms it from raw to cooked. No surprises there. However, when it comes to broccoli, the method of cooking significantly impacts nutrient retention. The best method, steaming, preserves chlorophyll, soluble proteins, sugar, vitamin C and glucosinolates the best. The way to steam is to boil water, place a steaming basket on top with the chopped broccoli and a lid and steam for 10 minutes.

The second-best method is to roast the broccoli in the oven for 30-35 minutes at roughly 200°C. Thirdly, microwave the broccoli for 5 minutes at 1000W. This is a fast, cheap way to cook the broccoli without losing a significant portion of the nutrients via water losses.

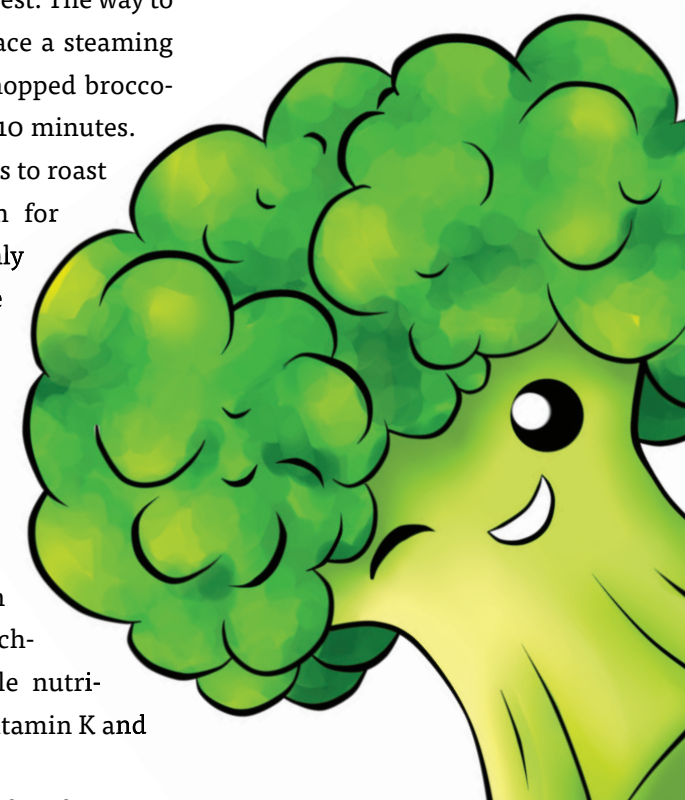
Boiling the broccoli in water for five minutes leaches out most water-soluble nutrients such as Vitamin C, Vitamin K and water-soluble sugars.

Boiling broccoli also makes them very soft and uncomfortable to eat. Steamed

broccoli are crunchy to eat, while roasting broccoli in the oven makes them very delicious, especially when paired with your favourite spices and a little bit of oil to coat.

Grow to love

Broccoli is the most hated vegetable among children; a running joke within our society that has damaged its image quite a bit. Truth be told, broccoli is not only incredibly healthy and delicious, but also requires little water, is cheap to grow and emits very little carbon (0.27kg per pound, of which the majority is transportation and packaging). I agree with Filip; I am also Team Broc.

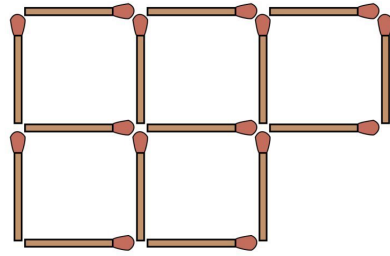


HiClipArt

PUZZLES

Answers for Issue 1828

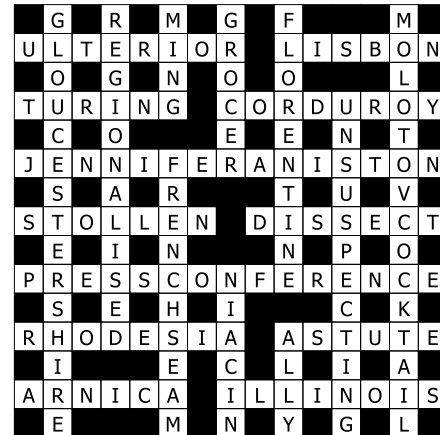
Howdy Puzzlers! A three part puzzle this time: can you remove 3 matches from the shape on the right to leave:



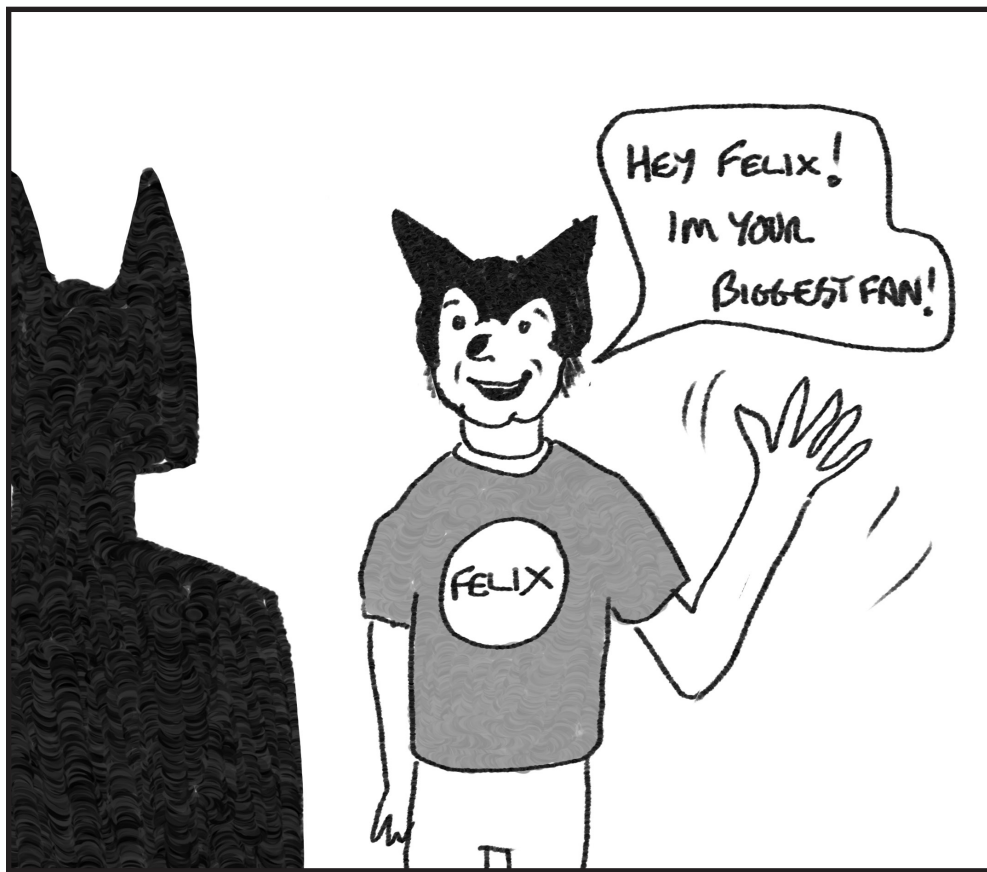
Matchstick squares

- 3 squares,
- 5 squares,
- or
- 2 squares?

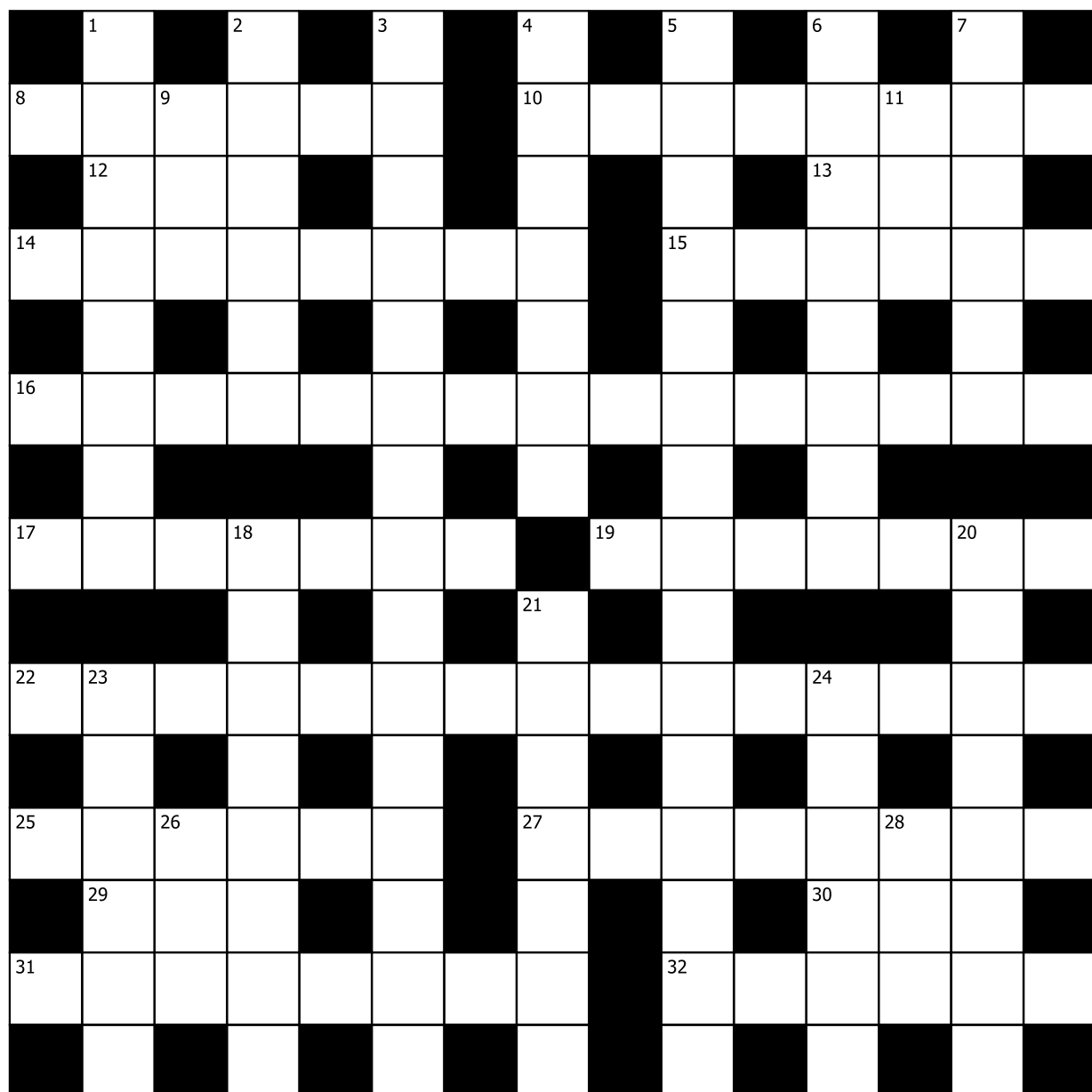
(Can you get them all?)



(not) FELIX #010



CROSSWORD



Across

- 8. New SI prefix. [6]
- 10. Product of grain. [3 5]
- 12. Pen. [3]
- 13. Container for ash. [3]
- 14. With regular frequency. [8]
- 15. Baggins' companion in The Lord of the Rings. [6]
- 16. State of no possible return. [15]
- 17. One of gaming's K/D/A. [7]
- 19. Type of swimming pool or cinema, e.g. [7]
- 22. Layabout's remuneration. [5 3 3 4]
- 25. It can come before bread and butter. [6]
- 27. Strategy of old Japanese spies. [8]
- 29. Latin interrogative. [3]
- 30. Mai ___. [3]
- 31. Starter, if finisher is "auf Wiedersehen", perhaps. [5 3]
- 32. Detective. [6]

Down

- 1. Condiments. [8]
- 2. Reaper's implement. [6]
- 3. Old US bank note. [4 11]
- 4. Like a thin cloud. [7]
- 5. Characteristic of PBS's Mr. Rogers [15].
- 6. Screwed. [8]
- 7. Least mad. [6]
- 9. Greek letter. [3]
- 11. Antiquated unit of energy. [3]
- 18. They're dwindling due to climate change. [3 5]
- 20. Antipode. [8]
- 21. Section of prehistory. [4 3]
- 23. Unclear. [6]
- 26. You can get stuck in one. [3]
- 28. Greek letter. [3]

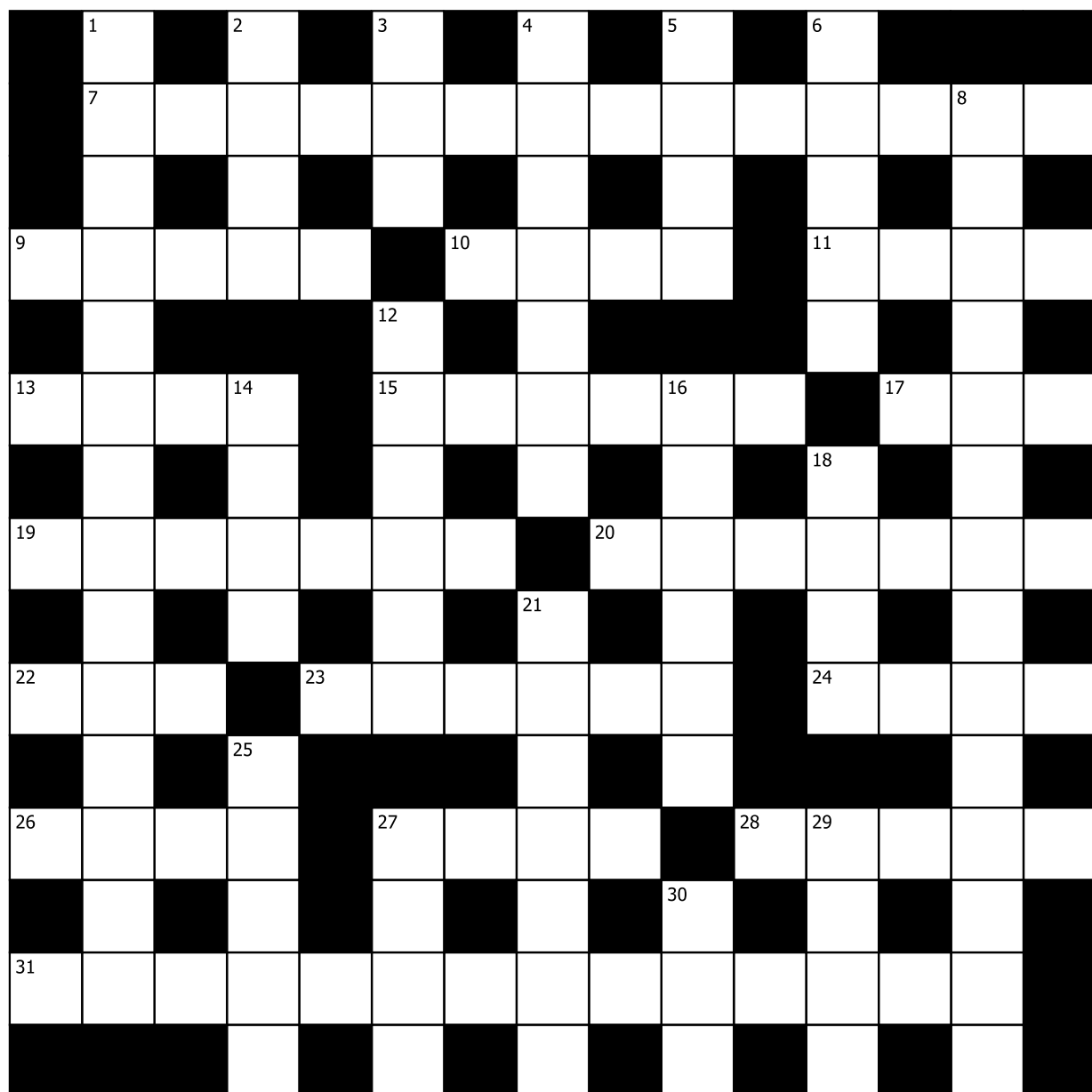
SUDOKU - EASY

1			8					
9						2		6
			6				7	
5	3					7		
				1			2	8
		9		4				
		6					8	
7		3					9	4
4					8			

				1				5
	7			5				4
						7	6	
		2						
		3				4		2
	8			9	7			
2		1				8		
6			3				1	
		9			1	5		6

	1			8				
	5						1	9
						8	7	
	2					9		
	3	7		5	6			
1		8			7			
		4	5					3
					3	6		5
			2				8	

CRYPTIC CROSSWORD



Across

- 7. I'm an expert at inner visions, when they're spontaneous. [14]
- 9. *Numbers game. [5]
- 10. *8. [4]
- 11. University college in Milton Keynes is garbage. [4]
- 13. Most crazy women make wild noise. [4]
- 15. Close to a state with the wild bear inhabitants. [6]
- 17. She hangs clothes. [3]
- 19. Housing left decays with age. [7]
- 20. Miso soup evidently requires some initial rearrangements. [7]
- 22. Could flower? [3]
- 23. Manoeuvre around the ring from both sides. [6]
- 24. *14. [4]
- 26. *4. [4]
- 27. Even if big, join the nation. [4]
- 28. *27. [5]
- 31. It got suspended in New York! [8 6]

Down

- 1. Thin girl Aretha could be even thinner! [7 4 3]
- 2. Pod-inhabitants went stir-crazy, becoming beasts. [4]
- 3. Simpson went back to West Yorkshire for fun. [3]
- 4. Transient signal cut off after 80% limit. [7]
- 5. Newfangled extraction of tooth. [4]
- 6. Machine in zoo first to implant engineered animal. [5]
- 8. Missile type we pre-launched, or exploded, off the hilltop. [7-7]
- 12. *8. [6]
- 14. Draw up the wing. [4]
- 16. *13. [6]
- 18. Between them, I rate the leader. [4]
- 21. Helen's people try to chip away Jan's circle behind her back. [6]
- 25. Open up the good seats on the world stage? [5]
- 27. People in song. [4]
- 29. Pluck your dulcimer: it's heard in Pakistan. [4]
- 30. Oddly wordy and sarcastic. [3]

SUDOKU - MODERATE

	7		8				5	4
		8				6	2	
	8	2		6	9		3	
	4		2		1			
		9					1	
				9				6
			1	3			4	
			4		5	1		

6	3	4	9					
2						7		
1			4				6	
	7						3	
				1		8		
				4	5			
		8				5		1
		9	8		3			
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				3				8
1	9							
			4			2	6	
					1	7	5	
	8			6				
	2				5	8		4
		8			9			
6							9	
		4	1					7