What can we do to inspire the next generation of female STEM leaders?
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Shifting to renewables and ‘green ammonia’
Dear readers, We round off this academic year with the successful roll-out of the COVID-19 vaccine in the UK to finally bring some sense of normality back into our lives. However, we are aware of the ongoing challenges posed by a global pandemic and are committed to efforts to tackle it.

CEB has continued adapting its teaching and research activities during this second academic year impacted by COVID-19 and remains committed to delivering the best education to all its students and the best research outputs for a healthier and more sustainable world.

In the last issue, our Head of Department, Professor Clemens Kaminski, shared his aspirations to meet the pressing needs of the modern world. In this issue, following the success of our International Women’s Day panel discussion (see ‘CEB Women’ section), our MPhil Bioscience Enterprise 2020-2021 student, Liseli Sumbwanyambe, highlights the impact of female role models in STEM, sharing her valuable personal experience as well as insights from other department members.

Teaching Matters’ includes an update from Rachael Tuley on the end of the academic year for our undergraduates, as well as a note from our new student-led CU Chemical Engineering Society Committee (CUCES).

The ‘Research highlights’ section reviews our latest research breakthroughs: a bioengineered model of the human intestine that could be used for drug testing and personalised medicine, redefining the Haber-Bosch loop and new research that shows single vessel synthesis and separation of ammonia.

‘Biotech Matters’ features a piece on biotechnology and chemical engineering disciplines working together to tackle the biggest global challenges.

Amongst some of the ‘achievements’ worth noting: Professor Lynn Gladden’s appointment as Queen Elizabeth Prize judging panel chair, Nakul Rampal’s Global Young Scientists Summit video competition win, Part I students beer design competition, CEB student Drew Taylor’s Cambridge-Oxford men’s Boat Race win, and Tianran Doherty’s Ernest Oppenheimer Early Career Fellowship award.

‘Alumni Corner’ reports the recent untimely death of Biotechnology alumna Professor Katharina Gaus as well as the recent passing of Chemical Engineering alumnus Dr John Grace. We also report on Dr Jessica Qcamos-Colina’s Cambridge Independent Science and Technology ‘CEO of the Year’ and ‘CleanTech’ award nominations with her venture Camnexus IoT and Professor Su Shing Lam’s recognition in 2020 Top Research Scientists.

We have continued delivering our outreach event offering online and we successfully wrapped up our contribution to the first virtual Cambridge Festival and our new outreach initiative, the Davidson Inventors Challenge competition. We also report on the positive impact of our first successful Chemical Engineering Connect Day for Arkwright Scholars hosted by Smallpeice Trust. We are expecting to return to some in-person activities next academic year, although some element of digital provision is expected to stay. In the meantime, CEB continues its exciting and diverse programme of events during the summer with our first Sutton Trust Chemical Engineering Summer School and the virtual July and September Open Days.

‘CEB Women’ features CEB STEM ambassador Sarah Barron on ‘Rising Wise’ to support women in STEM and business. Finally, ‘Teatime Teaser’ brings you an overview of how ‘Alumni Corner’ reports the recent untimely death of Biotechnology alumna Professor Katharina Gaus as well as the recent passing of Chemical Engineering alumnus Dr John Grace. We also report on Dr Jessica Qcamos-Colina’s Cambridge Independent Science and Technology ‘CEO of the Year’ and ‘CleanTech’ award nominations with her venture Camnexus IoT and Professor Su Shing Lam’s recognition in 2020 Top Research Scientists.

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With best wishes,

Elena Gonzalez
Chief Editor

Message from our HoD

Dear readers,

I am delighted to announce that our planned new undergraduate Tripos in Chemical Engineering and Biotechnology has been approved to go ahead by the University. For the first time in the history of the department, we will have full control over entry into the course and students will be with us from year one. The four-year undergraduate course will permit us to modernise the teaching provision for our students, bringing the latest advances of our discipline into the syllabus, and making best use of the world leading expertise from all our staff members. I thank Professor Geoff Moggridge for his vision to develop the concept for the course, and Dr Andy Sederman, Dr Patrick Barrie, and Rachael Tuley for doing so much behind the scenes to get it off the ground. There is much work ahead over the coming months with the first batch of students due to arrive in October 2023, but these are exciting times for our department. We will cover more details on our plans for the course in future issues of CEB Focus.

Responsible leadership and an inclusive approach to innovation and professional practice are at the heart of what we want to teach. I am particularly pleased in this context to note that CEB were able to retain their Athena SWAN Bronze status. My thanks go to Dr David Fairen Jimenez and our Athena SWAN Working Group for making this happen. Providing opportunities for all and creating a work environment where individuals thrive without prejudice is key for a world leading institution like ours. Inspiring role models are important in such efforts and in this issue you can read about Liseli Sumbwanyambe and other department members’ experience of female role models in STEM. CEB is an inspiring place.

As this issue goes to press, we note with sadness the passing of CEB alumnus Dr Ron Nedderman, who was a dear friend, a valued colleague, and a vital force for the success of our department. We will pay our tributes to Ron and his many achievements in the next issue of the newsletter.

I hope you enjoy reading this issue of CEB Focus.

Clemens

Head of Department, Professor C. Kaminski, in front of CEB research buildings © University of Cambridge. Photo by Phil Mynott.
What can we do to inspire the next generation of female STEM leaders?

Liseli Sumbwanyambe, MPhil Bioscience Enterprise (2020-2021)

A recent survey found respondents were more likely to recognise Dr Amy Farrah Fowler from the Big Bang Theory than any ‘real life’ celebrated scientist. More concerning, only 1 in 10 people can identify a present-day female role model in science, technology, engineering and maths (STEM)\(^2\). As diversity and inclusion initiatives break down the barriers to connect with young people, the question remains of what can we do to inspire the next generation?

The "leaky pipeline" metaphor denotes the decrease of female representation within STEM as roles become more senior. While there is no single solution to filling these gaps, a study found that exposure to role models increased young girls’ aspirations for future careers in STEM by 15\(^\circ\)\(^2\). A major driver of STEM avoidance in women (and affinity in men) is the existing stereotype of what STEM ‘looks’ like. If I asked you to name five scientists, how many would be women? If you named a woman... was it Marie Curie? Studies have found women working in STEM and STEM institutions have a significant influence on young people’s career aspirations, creating a clear opportunity to support from within the community\(^2\).

As a young black woman, I have experienced lack of representation, not only due to my gender, but also my race. As I navigate my early career in STEM, I thank a range of role models for encouraging me to step outside my comfort zone. To me, a role model is more than just a person you look up to. They are people who support you to unlock your potential by allowing you to learn vicariously what you should (and shouldn’t) do in both professional and personal life. These role models were not always more senior than me, or looked the same as me, but they did see potential.

Ultimately, everyone has the potential to be an impactful role model. It is difficult to quantify the effect your actions have on another’s life. However, in some cases, you might become the catalyst to someone making a decision they might not have had the confidence to even consider before. It is important to recognise the progress we have seen in the representation of women in STEM, but we still have a long way to go. If this resonates with you, please take some time to think how you could support future female leaders. Whether this is through championing and celebrating your female peers’ achievements, or replying to a LinkedIn message asking for advice, your actions may have a significant effect on future generations.
The impact of female role models: insights from the department

We reached out to members of the department to understand how female role models have impacted their career journey.

Charlotte Davison PhD
(MPhil Bioscience Enterprise Student)
To me, a good role model is someone who demonstrates a “can-do” attitude to defy the odds and achieve their goals. My undergraduate academic supervisor epitomised this attitude. Despite great accomplishments, she candidly spoke of the difficulties she faced and actively sought to help other people handle similar issues and achieve their best. She is an inspirational woman and motivated me to continue working in science.

Aishwarya Khanduja
(MPhil Bioscience Enterprise Student)
When I say having a female role model changed my life – I am not exaggerating. I met Dr Christine Gibson when I asked her to do a talk at a global health conference I co-founded. She ended up becoming my mentor and a collaborator from that point forward. She has been my champion and support in everything from navigating personal life to guiding my career path. We even co-created an online platform offering integrated mental health solutions as a rapid COVID-19 response in 2020. As a female founder, having female role models and mentors is of the utmost importance. I am so lucky to have her.
Harry Freeman

(MPhil Bioscience Enterprise Student)

In both the sentimental and literal sense, I could not be here without my mother. Brought up in a council estate in Wigan in a single parent family, she left school to become a nurse and practiced for 14 years in critical care. When I was five, she started her academic journey becoming the first in her family to go to university, studying part-time to attain a BSc, MSc and recently a PhD. Through this journey, her pragmatism and determination were instilled within me, alongside an appreciation of her ceaseless effort to ensure I had the optimal environment to thrive.

Patrick Selby

(MBE Course Co-ordinator)

I have been very lucky to have had strong female role models in both my personal and professional life. They, without question, have shaped the person who I am today.

At home, my mum is my greatest inspiration. Raising six kids before going back to education and starting a new career as a healthcare professional, she taught me how to put others’ needs ahead of my own and appreciate what I already have around me. My grandmother comes in equal first place, as the person who has always pushed me to achieve all I can and demonstrating that work ethic is, usually, the best problem-solving technique.

At work, of the many mentors I have had, two women from my time at ARU taught me the most. Either directly by training my skills and challenging my mistakes, or indirectly learning how to conduct myself properly and focus on what is important.
Tonny Okedi
(PhD Candidate, Bioelectrochemical systems)

In the Venn diagram of experiences, there is an overlap between the experiences of minorities and women. Female role models have therefore been a critical part of my academic journey. Upon starting my PhD, two incredible role models in the department, now alumnae, Dr Arely Gonzalez and Dr Aazraa Pankan, were integral to my transition from the city to academia. Beyond the transfer of technical knowledge, the two were north stars and sources of moral support over the first year of my PhD as I navigated (read stumbled) a way to my own niche as a researcher in the field.

Professor Róisín Owens
(CEB Director of Research)

I find it hard to pinpoint a single female role model. Many women have been influential in my career so far, providing everything from moral support to tips on team management. My experience has been that I reached out to certain people at different times depending on problems I needed to solve: To a senior Professor in my field when I was struggling to find my USP as a group leader. To my mother (a teacher) when I received a really harsh evaluation from a student. To my sisters (both writers) when preparing a big European grant (which I got, thanks girls). To my gym buddy when I need to rant while planking. To my friend and colleague in the US when I need advice on anything from grants to husbands! These women are all role models to me, I reach out to them because I admire how they solve problems in their lives, and I hope this is a two-way street.

If you would like to find out more on how you can support developing female talent at CEB, please reach out to our Athena Swan Working Group on www.ceb.cam.ac.uk/about/equality/aswg

References:

1 CW Jobs [2019] "The Importance of Female Role Models in STEM". Available at: www.cwjobs.co.uk/advice/importance-of-female-role-models-in-stem

In what has been another extraordinary year, a year in which almost the entire 2020–21 academic session has been delivered online due to the ongoing Covid-19 pandemic, tribute must be paid to the staff and students who have adapted so successfully to the challenges of remote teaching and learning. Their resilience is to be celebrated. As was the case for the unprecedented 2020 examination period, this year’s assessments for all cohorts will be held online. Students have welcomed the format of this year’s examinations and are to be thanked for their understanding with regards to this matter. Although the national lockdown has been challenging for our students (no in-person laboratory sessions, loss of social interaction, online assessment), we have learned as a Department that certain aspects of the remote learning experience, such as the availability of lecture recordings, have been welcomed by all cohorts, and this will inform our approach to a potential blended learning model, moving forward.

Whilst looking to the future, the Department has been developing a new Tripos model, and in April 2021, the University gave its approval to the proposed Chemical Engineering and Biotechnology Tripos, which will welcome its first cohort of students in October 2023. The exciting new four-year programme features direct entry (students will no longer take the first year of the Tripos in either Natural Sciences or Engineering) and will comprise Parts IA, IB, II and III, leading ultimately to the M.Eng. Degree. Other key features planned include Makerspace activities in the first year; an increase in laboratory and computer skills provision in the second year; increased provision for the Design Project, including the entire Easter Term in the third year; weighting of the Research Project to be increased to 50% in the fourth year. The course content will be in closer alignment with staff research interests and expertise, and will combine modern elements of chemical engineering and quantitative biotechnology, with training in healthcare solutions and sustainable practice. We look forward to welcoming a new generation of scholars.

Undergraduate teaching matters and end of academic year highlights

Rachael Tuley, Academic Officer, Teaching and Examinations Co-ordinator

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Follow elections in March, the new 2021 – 2022 CUCES Committee are ready to take over and already have big plans for the remainder of this year and next year!

Starting with Easter term, CUCES is hoping to be able to arrange our first in-person social event since the first lockdown in early 2020. We know it’s been a tough year and the social should give everyone the opportunity to relax and see one another again. The Part Is will also finally be able to come together as a cohort! There will also be a few professional skills workshops in early May as well as an essential webinar from IChemE on summer internships and obtaining chartership, which all students are encouraged to attend.

Over the summer break, the new committee is looking forward to continuing the Network & Tea programme that was introduced by last year’s committee. The structure of the initiative will be similar to last year: short, informal, virtual networking sessions with company representatives during which students will have the opportunity to ask questions, gain insight and receive advice on applications to various industries. This year, there will be a greater focus on start-ups and sustainability-centric companies so if any company representatives are interested in taking part, please contact CUCES at chengsoc@ceb.cam.ac.uk

For Michaelmas and Lent terms, we aim to organise numerous careers events as well as bring back in-person social events such as the Christmas and annual dinners. We’ll also be selling society stash this year as well as putting together a new ChemEng family scheme which we hope will help the incoming Part Is transition to the department more smoothly.

As a committee we are really looking forward to the events in store for this year and are confident it will be a year to remember!

Introducing the new CUCES Committee

Luc Liedtke, Part IIA student and CUCES President

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As a committee we are really looking forward to the events in store for this year and are confident it will be a year to remember!
Lucy Cavendish College to offer £12,000 studentship for our Master’s in Bioscience Enterprise programme

The Department of Chemical Engineering and Biotechnology are pleased to announce this offer, which aims to support undertaking such a life-changing opportunity.

The MPhil in Bioscience Enterprise (MBE) embraces a both science and business focus, providing an unparalleled experience for those with an interest in enterprise and the ambition to found technology companies or take up leadership, executive or consultancy roles in the life sciences sector.

There will be either a single award of £12,000, or two half-awards of £6,000 each. The award will be granted based on financial need and a principal consideration will focus on how the award would enable the applicant to accomplish contributions in the life science sector and the Lucy Cavendish community.

To be eligible candidates must have selected Lucy Cavendish as their first College choice. Furthermore, candidates must have received an offer to join the programme in October 2021 and membership at Lucy Cavendish College before they can be considered for the award. To apply, applicants will be required to contact the MBE administration directly, via email at: mbe-admin@ceb.cam.ac.uk

More information on postgraduate study at Lucy Cavendish College

Anthony Haynes on “Practical techniques to enhance the quality of grey literature produced: the case of research posters”

A paper based on research posters in CEB was presented at the International Conference on Grey Literature (November, 2020).

The Department of Chemical Engineering and Biotechnology are pleased to announce this offer, which aims to support undertaking such a life-changing opportunity.

The paper, written by Anthony Haynes (Creative Director, Frontinus, was based on the workshop for PhD students that Anthony has presented in CEB annually over the last decade. The presentation was illustrated with draft posters by students past (Ipshita Mandal) and present (Yash Mishra).

The workshop is supported by two resources available online:
• on the Write Your Research website: www.writeyourresearch.wordpress.com/writing-designing-and-presenting-a-poster-beta-version
• as part of the Writing Protocols series: www.frontinus.org.uk/postcards/poster.pdf

Commenting on the conference, Anthony said, “Surprisingly little of the research on grey literature focuses on the question of how to build quality into the creative process. I’m grateful to Ipshita and Yash for helping me to make a contribution in this area”. A shortened version of the paper, entitled ‘Practical techniques to enhance the quality of grey literature produced: the case of research posters’, has since been published in the Conference proceedings (ISSN 1386-2316).
Bioengineered model of human intestine could be used for drug testing and personalised medicine

In the medical research field, there is great demand for in vitro models and in vitro human tissues (developed outside living organisms) for the study of disease mechanisms and for drug or treatment development, as they can provide results that are more relevant to the human system than animal models.

Most currently available models are two-dimensional – cells growing in a layer across a flat surface – and therefore don’t accurately mimic the shape, structure, and function of the tissues of the human body. Additionally, the methods used to validate results from these models also require disruption of the system: components need to be chemically labelled and probed, while samples need to be sectioned for optical analysis with microscopy.

To this end, researchers from our Bioelectronic Systems Technology (BEST) Group have developed a 3D, bioengineered model of the human intestine that uses a smart material scaffold to enable continuous in-line monitoring of the cells and tissues. The model uses an electrically active, biocompatible organic polymer called PEDOT:PSS as the substrate on which to grow the intestinal cells. Using this polymer, a special tube-shaped scaffold was designed to mimic the three-dimensional shape of the human intestine. Different cells give off different electrical signals, which can provide information on cell health, growth and activity. Because the scaffold on which the cells grow is conducting, the researchers can continuously monitor these signals to track how their tissue is developing.

In this way, the group hope the model can be used to test potential drug candidates with the goal of replacing, or at least complementing and reducing, some animal testing models, as well as enabling the study of diseases that occur in the gut in a continuous manner. “The gut is a tissue with a lot of interest behind it,” says Chrysanthi-Maria Moysidou, co-lead author on the paper and final year PhD student in the BEST group. “If we talk about drug testing and drug screening applications, particularly for drugs that we take orally, intestinal models are very important because it is the epithelial barrier of the gut that the drug substances will have to cross before they reach our bloodstream and, through that, their target tissue/organ in our body.”

In fact, the model is a key component of the group’s wider project, ‘IMBIBE’, in which they are aiming to build a multi-organ platform that can mimic communication between the gut, the brain and the microbiome. Ultimately, there is hope that the model will be useful for drug testing, allowing studies on human cells and tissue that may be more relevant than traditional models and animal studies. “This manuscript represents a tremendous amount of work culminating in the delivery of an advanced 3D model of the human intestine,” says Professor Róisín Owens, who leads the BEST group. “We look forward to seeing how our model can be used to advance medical research.”

References:

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Chemical looping of biomass shows potential as ‘carbon negative’ energy solution

n 2018, driven by increasing demand for energy worldwide, global energy-related carbon dioxide emissions rose by 1.7%, to an historic high of 33.1 gigatonnes. The amount of CO₂ in the atmosphere averaged around 407 parts per million that year. While there has been growth in the use of renewable and carbon-neutral energy sources, the effects of this are not enough to drop atmospheric CO₂ concentration to the level needed to avoid some of the disastrous consequences of climate change. To mitigate these issues there is increasing focus on carbon capture and storage technology that actively removes CO₂ from the atmosphere. But what happens when you combine an already carbon neutral energy source, with carbon capture technology that is not energy intensive? Meet the new aspirational standard in energy generation: carbon negative. Burning fossil fuels and biomass for energy generation both release carbon dioxide. However, the key difference is that, in the case of the latter, trees and plants absorb carbon dioxide from the atmosphere over the course of their lifetime for around 40 years on average. Upon combustion, they also release that same amount of CO₂ back into the atmosphere. In this way, energy derived from biomass can be carbon ‘neutral’. However, a new study, from researchers in the Energy Reactions and Carriers group at CEB, demonstrates the potential to take the process one step further. The group’s research focuses on a technique called chemical looping combustion – a method of ‘burning’ material by reacting it with an oxygen carrier, rather than air from the environment. The biomass is added to a reactor with the oxygen carrier – a chemical compound, often a metal oxide – which releases oxygen directly to the fuel, causing a combustion reaction that generates energy. The depleted carrier can be removed from the reactor and re-oxidised in air, ready to be used again, in a cyclical system. It is commonly known that a major barrier to the viability of carbon capture and storage technologies is the energy required to separate carbon dioxide from the other gases in air, predominantly nitrogen. This separation is, currently, incredibly energy-intensive and is often cited as a major drawback of carbon capture technologies, potentially superseding any environmental gains. Through chemical looping combustion, no separation is needed as there’s no air involved in the first place: the carbon dioxide can simply be collected straight from the reactor and passed directly to your chosen storage method, or even used as a reactant in future chemical processes. Coupled with the carbon neutral biomass fuel, the process can potentially be carbon negative. The new study from our Combustion Group demonstrates the chemical looping combustion of biomass char and presents some even more promising findings. For instance, chemical looping combustion leads to a more complete combustion process that reduces formation of undesirable soot and carbon monoxide, further simplifying CO₂ capture. Additionally, the combustion reaction rate is significantly higher. “Very surprisingly, the rate of reaction is much faster with chemical looping,” explains Kenny Kwong, a third-year PhD student in the Combustion Group. “If you look at how long it takes to burn the same size of biomass particle in air, the chemical looping combustion set up is three and a half times faster.” To find an explanation for this, the researchers set about solving the problem analytically, and managed to discover that improved mass transfer was the cause, as a result of the oxygen carrier continually releasing oxygen to the biochar surface, replenishing any consumed oxygen, unlike combustion with air. This ensures the oxygen concentration at the biochar particle surface remains consistently high, increasing the reaction rate. “Chemical looping combustion with oxygen uncoupling has been studied for energy production for about 10 years now,” explains Dr Ewa Marek, who leads our Combustion Group. “Yet Kenny is the first to derive an analytical solution for the process and quantitatively discuss arising enhancement effects.” However, while this combination of processes has great potential to provide carbon negative energy solutions, there is still more work to be done to enable its uptake across the energy industry. “To use chemical looping potentially requires restructuring your power plant and there are obviously costs involved in this,” adds Kwong. “That’s why this research is so important, because we are providing analytical solutions that help us to understand the science behind the process and can accelerate the technology-readiness.” References: Kwong, K.; Mao, R.; Scott, S.; Dennis, J.; Marek, E. Analysis of the Rate of Combustion of Biomass Char in a Fluidised Bed of CLOU Particles. Chemical Engineering Journal 2020, 127942.
Researchers from our Catalysis and Process Integration group, led by Dr Laura Torrente, have developed a new way to produce ammonia. The new system redefines the century old Haber-Bosch process within an energy landscape shifting to renewables, where ‘green ammonia’ will have a role as a long-term energy vector.

Industrial ammonia production is responsible for feeding 50% of people on Earth through fertilisers, but is also responsible for over 2% of global CO2 emissions. The Haber-Bosch process, that produces ammonia by combining nitrogen and hydrogen, was developed in the early 20th century. It is highly optimised and integrated but relies on the use of fossil fuels as both the hydrogen and energy source, producing what is called ‘brown ammonia’. By shifting to renewable energy, with hydrogen derived from water, and nitrogen from air, the optimisation constraints change, as described in previous work by the group published in Energy and Environmental Science.

Notably, renewable energy is isolated and intermittent, not centralised and continuous as required by the conventional Haber-Bosch process. Therefore, a new process is required for renewably-derived ammonia – known as ‘green ammonia’. By combining ammonia synthesis and separation in a single vessel, the need for a large recycle loop and heat exchange between the conventional reaction (run at temperatures above 400°C) and separation (condensation that requires temperatures below 0°C) is removed, leading to a low-capital and agile process. The research, published in Advanced Energy Materials, provides the proof-of-concept for such a process.

This proof-of-concept system combines two novelties: a cheap manganese (II) chloride (MnCl₂) absorbent, to separate ammonia at high temperatures, and a modified ruthenium catalyst to achieve high activity at low-temperatures, avoiding hydrogen poisoning. With a feasible process for making ‘green ammonia’ from renewable energy, the role for ammonia in the 21st century expands from sustainable fertiliser to long-term energy storage. Due to significant seasonal and regional misalliance between renewable energy supply and demand, feasible storage and transport of energy is required to achieve parity. To this end, in recent years, ammonia has gained a lot of interest as a potential way to store hydrogen for use as an energy source as it can be easily stored as a liquid near ambient conditions, with millions of tonnes already transported around the globe.

The group thinks this future ammonia industry integrated with a hydrogen economy will look very different than it does today. “We’re not trying to replace the conventional ammonia production on the same terms,” explains Collin Smith, PhD student and first author of the paper. “Because we’re operating under different constraints, we’re looking to distributed units – not gigantic plants – that are lower capital, more agile and fitting for renewable energy.”

References:
Chemical engineers working in biotechnology: the world is really their oyster

Elena Gonzalez and Sarah Barron

Our chemical engineers, biotechnologists and other scientists work together and capitalise on their combined interdisciplinary knowledge to tackle the biggest global challenges in energy and environment, sustainability and healthcare.

Chemical engineers work with ground-breaking technologies to enhance the quality of people’s lives in areas such as environmental protection, the management of resources and controlling health and safety. Biotechnologists use biological knowledge and techniques to create and develop innovative products designed to improve the quality of human life.

Biotechnology, as a whole, has applications in four major industry areas: health care (medical), crop production and agriculture, non-food (industrial) uses of crops and other products (e.g. biodegradable plastics, vegetable oil, biofuels) as well as environmental uses.

The IChemE has already revised its own strategy to fit with the UN Sustainable Development Goals and Engineering Grand Challenges, and there is definitely an evident demand for chemical engineers in the booming biotech industry.

Biotechnology encompasses many disciplines, covering chemistry, biology, physics, materials, tissue engineering, fluidics, and cell culture. Sometimes, it can be data intensive, so, data analysis, programming, and software skills would be important for roles involving efficient processing and data interpretation.

Public perception of the chemical industry is often inaccurate and misguided, and we need to make sure that we don’t perpetuate common myths. Chemical engineering is much more than oil and gas extraction. Chemical engineers don’t just work on oil and gas extraction or chemical plants, they also help to combat climate change with CO2 capture and storage technologies, develop renewable energy sources, and support sustainable production of pharmaceuticals, fine and heavy chemicals and agrochemicals.

They also work in the manufacturing industries supplying fibres and polymers, food and drink. As new biotech products move out of the lab and into production, opportunities for chemical engineers abound: they can work in many areas, from process development and scale-up, to manufacturing and process optimisation, such as producing low-cost healthcare diagnostics for low-middle income countries, producing biofuels for a green future and even developing COVID-19 vaccines to fight the global pandemic. A very good example of our combined efforts is shown in our fight against the global pandemic, where our biotechnologists and chemical engineers are working together to find sustainable solutions to the greatest challenges in healthcare and help develop COVID-19 vaccines.

Overall, our chemical engineers and biotechnologists are working together to tackle the biggest global challenges in energy and environment, sustainability and healthcare.

Source:
The Institution of Chemical Engineers (IChemE)
www.icheme.org
Our fight against covid www.ceb.cam.ac.uk/covid-research
Network & Tea with Industry Summer Programme

Han You Low, Part I student and CUCES Careers Officer

The new ‘Network & Tea’ initiative from the Cambridge University Chemical Engineering Society (CUCES) at CEB, aims to provide an informal setting for a small group of our chemical engineering undergraduates to network virtually with companies that they are interested in. The initiative will run over eight weeks in the summer and in each weekly session we will invite dedicated representatives from one company to connect with a small group of students that are particularly interested in the company or relevant industry. Based on the career interest survey completed by students, we wish to include a wide range of sectors, such as FMCG and consulting. We hope this initiative will kickstart our mentorship programme where industry representatives and students stay in touch after the event.

Any alumni/ae and industry reps that are interested in taking part in the initiative, please contact the Society via chengsoc@ceb.cam.ac.uk

International Technology Transfer to promote access and innovation in times of global crisis

Dr Jessica A. Ocampos, Carolina Sepúlveda

The COVID-19 pandemic has raised questions about technology transfer and global access to essential products, especially for countries with limited research and development capabilities and resources. The international response has been focused on programmes or projects to support developing countries access to essential health products, but they appear not to have long-term goals.

One of the most controversial discussions held at the World Trade Organization has been the proposal presented by South Africa and India, related to a patent waiver on COVID-19 vaccines and treatments during the pandemic. However, the problem that is facing the world goes far deeper than access to patents. R&D capabilities are concentrated in developed countries and manufacturing a new generation of vaccines (mRNA) is challenging in developing countries. Although there are some manufacturing capacities in developing countries, they are limited, especially when mRNA vaccines have been developed.

In our current pandemic, initiatives related to making available patent information, patent pools or compulsory licensing, do not deliver long term results because patent information usually is not sufficient to reproduce technology.

The initiative’s new logo, designed by Polina Abrosimova - Part I student and CUCES IT & Publicity Officer
The magnitude of the actual crisis, prompts a different and long-term approach to deal with current and future crises in a more sustainable way, enhancing R&D, technological, and manufacturing capabilities in developing countries. This would allow not only access to essential technologies but also enable the development of indigenous capabilities.

This is being argued in the recent paper published at LESI and written by Dr. Jessica Ocampos and Carolina Sepulveda. Dr. Ocampos-Colina is an alumna of CEB (King’s College, 2010), expert on innovation and technology transfer, fellow at the Centre for Environment, Energy and Natural Resource Governance (C-EENRG) and associate of the International Outreach Programme in the University of Cambridge. Ms Sepulveda is a lawyer, expert in intellectual property for the Chilean government.

"Building on and combining our expertise on international tech transfer, innovation policy and intellectual property rights, we proposed to revise the role of international tech transfer (ITT) and the need to focus on the development of domestic innovation absorption capacity. Year 2020 brought a new meaning to the word challenge. Personally, the natural response was through collaboration, proven incredibly fruitful, such as the one with Ms Sepulveda in Chile," says Dr Ocampos-Colina.

The authors argue that International Organisations may play a key role in encouraging ITT. Strong evidence recommends designing strategies that will forge a pathway for national development, with the commitment to create indigenous capacities as part of the innovation strategy, and technology ownership incentives to participate in meaningful technology transfer. Finally, these strategies would foster technological internationalization and economic growth.


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Being able to read patent information is not technology transfer. Therefore, the current situation is perpetuating the supply dependency model between developed and developing countries.
Cambridge scored a double victory in the Boat Race 2021, with both the women’s and men’s crews coming out on top following two thrilling races on the Great Ouse at Ely. Drew Taylor, a student on our MPhil in Bioscience Enterprise course, raced at stroke in the Cambridge Men’s team.

“I wasn’t completely sure whether or not I would row when I came to Cambridge, but within moments of getting oriented on campus and seeing crews rowing past on the Cam, I knew I wanted to row in a place where the sport is so celebrated,” said Drew. “Trialling for the University team through lockdowns and intense COVID restrictions was one of the most challenging things I’ve done, but the result of winning the Boat Race certainly makes me reflect back on the process fondly. Most importantly, getting to know an incredible group of guys over the course of a strange, tough year of training has been one of the most rewarding things I’ve done in my life.”

In the closest women’s race since 2011 and the closest men’s race since 2003, Cambridge took both trophies in an unprecedented and unique event raced between Ely and Littleport in Cambridgeshire. The event was moved from the usual course, along the Thames in London, because of a combination of the COVID-19 pandemic and repair work on Hammersmith Bridge.

The victories in both the 75th Women’s Boat Race and the 166th Men’s Boat Race mean that Cambridge extends its lead on Oxford 44-30 in the Women’s Boat Race and 84-80 in the Men’s Boat Race.


Virtual Beer Design for Part 1 students

As part of their biotechnology course, the Part I students took part in a virtual microbrewery session earlier in the year, facilitated with the help of Roughacre Beer, and were given the chance to design their own brews. The students produced two-minute promotional videos which were played as part of a “live” session at their showcase event on 12 March.

The beer design challenge was led by Professor Róisín M. Owens. The judging panel for the beer design focused on the technique used to make the beer, method for incorporating flavours (beer style) and marketing of the beer. Judges were our own Lecturer in Brewing and Distilling Science, Dr Katherine Smart, and Dr Anthie Moysidou PhD, Part I student supervisor and ‘craft beer geek’, as well as Phil Salway and Dr David Fairen-Jimenez, both with experience of brewing beer at home. Professor Owens moderated the session remarking on the “professional nature of the videos produced, which showed real thought, particularly in terms of marketing and branding”.

Dr Smart noted: “I especially enjoyed the marketing video which could have been a TV advert in itself – Erin, fantastic, incredible. I was struck by all the different ideas presented and the different individual personalities and passions coming through. It was great to make the connection between the brand and sustainable processes, and it will be very tough to mark! The whole exercise was like a day at Diageo where we create new beers and products all the time.”

The virtual audience was also called to get involved and help judge the beers presented and student Erin Jean’s beer was awarded the Judges No. 1 and ‘Popular vote No. 1’!
Tiarnan Doherty awarded Ernest Oppenheimer Early Career Fellowship

Tiarnan Doherty, a final year PhD student in our Optoelectronic Materials and Device Spectroscopy Group, has been awarded a three-year Oppenheimer Fellowship from the School of Technology in addition to a Research Fellowship from Murray Edwards College.

The fellowships will enable Tiarnan to pursue an independent programme of post-doctoral research, an important step on the path to becoming a principal investigator with an established research group. For his PhD project, Tiarnan has been working with Dr Sam Stranks, head of our Optoelectronic Materials and Device Spectroscopy Group, investigating perovskite materials for solar cells.

Tiarnan’s PhD project has so far focused on understanding where performance losses originate in perovskite based solar cells. The Oppenheimer Fellowship will enable him to move his research in a new direction over a three-year period, seeking to utilise perovskite materials as X-ray detectors where they have the potential to provide a higher level of detection with a lower dose of X-rays than current medical and security devices and could find use in the next generation of CT scanners. While an independent fellow, Tiarnan will still work closely with Stranks and other members of the optoelectronics team.

"X-ray detectors are a really promising application for perovskites," says Tiarnan. "Because perovskites are composed of heavy and earth abundant elements, like lead, they are very effective at stopping X-rays, making them extremely sensitive and cheap materials for X-ray detection. One of the big barriers in using perovskites for X-ray detectors is that the material degrades rapidly when exposed to atmosphere. We've had some recent success in overcoming these instabilities and the Oppenheimer Fellowship is a great opportunity for me to focus on translating our results to fully operational devices.

Tiarnan will be based at CEB as an Oppenheimer Fellow and Murray Edwards College as a Research Fellow from October this year. A new radioluminescence lab is currently being established in CEB and will be a key component of his, and many other members of the University's research.

Lynn Gladden named as Queen Elizabeth Prize judging panel chair

Professor Dame Lynn Gladden, from Cambridge’s Department of Chemical Engineering and Biotechnology, has been appointed as the new chair of the Queen Elizabeth Prize for Engineering judging panel.

The QEPrize is the world’s most prestigious engineering prize, celebrating the engineers responsible for ground-breaking innovations in engineering that have been of global benefit to humanity.

The prize aims to raise the public profile of engineering and inspire young people to take up the engineering challenges of the future.

Professor Gladden, who is currently Executive Chair of the Engineering and Physical Sciences Research Council (EPSRC), said:

“I am honoured to be asked to Chair the QEPrize judging panel of internationally distinguished engineers.

“It is tremendously stimulating to work with some of the leading engineers of our generation to select winning innovations from among so many excellent nominations.

“The QEPrize is the world’s highest accolade for engineers, recognising the profound effect the profession has across the globe and serving to inspire a new generation of engineers. I look forward very much to our work on the judging panel to find the next winning nomination.”

In addition to her role as EPSRC Executive Chair, Professor Gladden is Shell Professor of Chemical Engineering at the University of Cambridge. She is a Fellow of both the Royal Academy of Engineering and the Royal Society and a foreign member of the US National Academy of Engineering.

Professor Gladden is internationally recognised for her work on advancing magnetic resonance imaging techniques, originally developed for use in the medical environment.

She has used them in engineering research to gain a greater understanding of the physical and chemical phenomena that determine the performance of chemical processes and their resulting products.

Source:
www.cam.ac.uk/research/news/lynn-gladden-named-as-queen-elizabeth-prize-judging-panel-chair
In memoriam: Professor Katharina (Kat) Gaus (12/9/1972 – 3/3/2021)

It is with great sadness that we report that Biotechnology alumna Professor Katharina (Kat) Gaus sadly passed away on 3 March 2021, aged 48, after a short but aggressive illness with cancer.

She was as a very accomplished immunologist and molecular microscopist. She did her PhD with our former Head of Department, Professor Lisa Hall. She also met the Postdoc and alumnus Dr Justin Gooding while in Cambridge, who was working in the same research group, Cambridge Analytical Biotechnology. She later married Justin and their lives together were very much a partnership, both privately and often professionally.

Kat obtained her PhD in 1999 in the former Institute of Biotechnology, creating a ligand library for low density lipoprotein (an indicator of potential heart disease) integrated with a surface plasmon optical model to detect protein-protein interactions.

Following her studies at the University of Cambridge, Kat joined the Cell Biology Group at the Heart Research Institute in Sydney, Australia. She moved to the Centre for Vascular Research at the University of New South Wales in 2002. In 2005, Kat founded the Cellular Membrane Biology Lab, part of the Centre for Vascular Research at the University of New South Wales. She became a senior research fellow and associate professor of the National Health and Medical Research Council (NHMRC) in Australia in 2009.

Kat was an NHMRC Senior Research Fellow at the University of New South Wales (UNSW Sydney) and Head of the EMBL Australia Node in Single Molecule Science. She was also the Deputy Director of the ARC Centre of Excellence in Advanced Molecular Imaging, and the NSW Node leader of EMBL Australia.

In 2005, Professor Gaus was awarded the ARC Early Researcher Award, a NSW Young Tall Poppy Award and an Alexander von Humboldt Fellowship. In 2013, she received the New South Wales Science and Engineering Award for Excellence in Biological Sciences. Among the many accolades received, she was awarded the prestigious Gottschalk Medal from the Australian Academy of Science in 2012, was elected Fellow of the Australian Academy of Health and Medical Sciences (FAHMS) in 2015 and received the NHMRC Achievement Award (Elizabeth Blackburn Fellowship, 2014-2018) and the Khwarizmi International Award (2018).

Kat was also an active advocate of girls entering scientific fields. She was a passionate role model for women in STEM and was heavily involved in the UNSW outreach programmes.

At the virtual funeral, her husband Justin spoke about her latest super resolution microscopy research. The fantastic legacy she leaves behind is Single Molecule Science at UNSW and her vision of T cell molecules.

Professor Lisa Hall recalls Kat’s innovation and excellence in everything she touched in science; she commented that nobody would forget that mischievous quiet smile and humility in her achievements. Science has lost a champion; she will be so very much missed.

CEB would like to send our condolences to her family and friends for their loss on behalf of the whole department.

"The fantastic legacy she leaves behind is Single Molecule Science at UNSW and hervision of T cell molecules."
The beloved friend and mentor to our community, John was a professor emeritus in the Department of Chemical and Biological Engineering (CHBE) at The University of British Columbia (UBC). He served as Head of CHBE (then known as Chemical Engineering) from 1979 to 1987, and later as Dean of the Faculty of Graduate and Post-Doctoral Studies (formerly Graduate Studies) from 1990 to 1996.

John Grace was born in London, Ontario in 1943. He graduated with a B.E.Sc. (1965) from Western University (formerly the University of Western Ontario), and a PhD from CEB, under the supervision of Sir David Harrison, in 1968. In addition to those degrees, in 2003 John was awarded an honorary doctorate from Western University. For the first 11 years of his distinguished academic career, John was a faculty member in the Chemical Engineering Department at McGill University. In 1979 he then joined the UBC CHBE department as its Head.

Among the many prestigious honours he received, Professor Grace was invested as an Officer of the Order of Canada in 2014. The citation on his Order of Canada investiture reads: ‘For his contributions as a chemical engineer, notably to the development of cleaner technology for industrial processes and energy production. John Grace has crafted new ways to produce energy with a smaller environmental footprint. A Canada Research Chair and professor in the Department of Chemical and Biological Engineering at the University of British Columbia, he is one of the world’s leading authorities on fluidization, the process by which solid particles are converted to a dynamic state. His research and publications have led to significant advances in the field, including the development of more efficient reactors to produce electrical power, fuels and steam while reducing greenhouse gas emissions.’

In February of this year, the University of British Columbia (UBC) in Canada awarded him the Hall of Fame Award. A plaque in his name will also be placed on the CHBE Hall of Fame wall in the atrium of the Chemical and Biological Engineering Building at UBC. On receiving this honour earlier in the year, John said: “Recognition coming from people one has worked with is particularly gratifying. I am very pleased to receive this award from a Chemical and Biological Engineering Department that is growing in importance, as well as in size.”

Sir David Harrison, former member of CEB Faculty and John Grace’s PhD supervisor during his time at CEB, shared recollections of Dr Grace earlier this year: “I have known John for over 50 years, and I was his PhD supervisor during 1965-68 in the Chemical Engineering Department in Cambridge. He came to the UK with support from an Athlone Fellowship and the National Research Council of Canada. In Cambridge he joined King’s College and he and Sherrill lived in college accommodation in the heart of the city near both the College and the Department.

“His highly successful dissertation was entitled ‘The behaviour of baffled and unbaffled Fluidised beds’; a field of work that was to influence much of his academic life. His research was beautifully presented, and it was particularly notable that he was able to report, as he submitted the final text of his work, that most was already on its way to publication. John also had another talent and that was a command of the English language to a degree unusual in Engineering graduate students. “Altogether, therefore I came to know and much enjoy the company of a very fine graduate student already on course for a distinguished university career.”

CEB would like to send our condolences to John’s family and friends for their loss on behalf of the whole department.

For those who would like to donate in honour of John’s memory, the Grace family has asked that donations be made to the John Grace Graduate Scholarship in Chemical and Biological Engineering, for graduate students in Chemical and Biological Engineering who demonstrate academic excellence and potential for service to society by performing research on energy, the environment, and/or multi-phase systems. Financial donations can be made at www.give.ubc.ca/memorial/dr-john-grace/. Please contact CHBE at info@chbe.ubc.ca for further details.

Sources:
www.chbe.ubc.ca/our-people/chbe-hall-of-fame
https://www.chbe.ubc.ca/2021/05/27/celebrating-the-life-of-dr-john-grace/
Professor Su Shiung Lam recognised in 2020 Top Research Scientists Malaysia

Alumnus Professor Su Shiung ('Can') Lam was recognised as one of the 2020 Top Research Scientists Malaysia (TRSM) by the Academy of Sciences Malaysia (ASM).

Professor Lam completed his PhD on waste oil recycling in this department in 2011 under the supervision of Professor Howard Chase. Professor Lam is now a tenured Professor at Universiti Malaysia Terengganu, and currently the Deputy Director of the International Centre. His research is in chemical and environmental engineering, focusing on waste and biomass utilisation, thermal processes and green technology. The ASM recently recognised 30 outstanding scientists as the 2020 Top Research Scientists Malaysia (TRSM), in line with its focus on fostering a culture of excellence in science, technology and innovation. The recognition is given to active Malaysian research scientists with outstanding achievements in those areas and who have been nationally and internationally recognised.

The recipients are leading research scientists who have been actively pushing the boundaries of national research and innovation to generate new knowledge, make discoveries, create value-added opportunities and translate their research into meaningful and impactful outcomes that can significantly contribute to the socio-economic transformation of the nation. TRSM recipients are role models of excellence who will become mentors to the next generation and leaders to forge ahead with the innovation agenda of the nation.

“It is truly a blessing for me to receive this honour and this is indeed a great motivation and momentum from dedicating myself to science, technology, innovation and academia as a Malaysian,” said Professor Lam. “I would like to express my gratitude to Professor Howard Chase and this department for guiding, building and leading me to this recognition.”

Dr Jessica Ocampos-Colina double-nomination in the Science and Technology Awards by Cambridge Independent

For the second year in a row, Dr Jessica Ocampos-Colina and her company, Camnexus, have been nominated finalist in the Science and Technology Awards 2020 organised by Cambridge Independent newspaper. Camnexus was nominated finalist in the category of “Cleantech Company of the Year 2020” and Dr Ocampos-Colina was also nominated in the category of “CEO of the Year” Awards organised by Cambridge Independent.

Camnexus is a technology company founded by two PhD students from the University of Cambridge: Dr Jessica Ocampos-Colina and Dr Pablo Salas-Braza, both Chileans and fellows of the Centre for Environment, Energy and Natural Resources Governance of the University of Cambridge. Camnexus aims to bridge the digital gap for sustainable development, promoting the digital transformation in key productive sectors with low-power sensors and communication technologies combining AI and IoT.

Both, the company and Dr Ocampos-Colina, have received several grants and awards, including grants from Innovate UK [Demonstrate Impact Fund in 2019], Research England [University of Cambridge Global Challenge Research Fund, GCRF, 2018 and 2020], Women in Engineering Finalist, Cambridge Wireless, Technology Awards 2020; nominated Pioneer of the New World, postCOVID19 by Financial Times, Sifted EU, 2020, and the Highly Commended Cleantech Company of the Year 2019 prize by the Science and Technology Awards of Cambridge Independent. Based on her inspiring work, Dr Ocampos-Colina was invited to give a TED talk about inclusive innovation in 2019. Sources: www.cambridgeindependent.co.uk/business/finalists-in-the-2020-cambridge-independent-science-and-technology-awards-revealed-9129469 www.camnexus.io

TED talk on inclusive innovation in 2019 www.bit.ly/3h8GeP2

Camnexus finalist award in the category of Cleantech Company of the Year 2019 Credit @ Cambridge Independent. (Pre-covid image)
The Davidson Inventors Challenge (DIC) is a new project being piloted with UK schools during this academic year. This new initiative is a collaboration between our department and the Association of Science Technology and Innovation (ASTI) in Malaysia led by one of our alumni Dr Yunus Yasin. The DIC is aimed at young students interested in STEM in tribute to our Emeritus Professor John Davidson, and former Head of Department, who sadly passed away last December. He was known as “the founding father of fluidisation” and worked in chemical engineering since 1952, including the areas of fluid flow, process dynamics, gas absorption and fluidisation technology, remaining very active until his death. He was passionate about his students, interested in their well-being and enjoyed their questions. He was always committed to the very highest standards of teaching and research and often had simple solutions relying on a profound understanding of the fundamentals.

The theme for DIC Invention is the Sustainable Development Goals (SDGs) developed by the United Nations to address global challenges as noted in the SDGs strategy, students will have a go at problem-solving and come up with innovative solutions, which are key skills chemical engineers learn, develop, and put into practice on a day-to-day basis. In this way, they will not only get first-hand experience and become familiar with the diverse applications of chemical engineering and biotechnology, but they will also learn about the important role chemical engineers and biotechnologists play in tackling the toughest global challenges.

This year’s final competition saw four great teams give very impressive and innovative presentations ranging from eliminating racial bias in pulse oximeters, to green batteries and cost-efficient parabolic solar dishes. This year’s winners however, were team AdMeliora - the inventors of biodegradable facemasks made from food waste. This team demonstrated a clear understanding of a relevant global topic and environmental issue of the global COVID pandemic with concurrent PPE landfill waste.

Team AdMeliora are this year’s Davidson Inventors Challenge 2021 Winners!

The winners of the Davidson Inventors Challenge (DIC) 2021.

The winners of the Davidson Inventors Challenge (DIC) 2021.

Chemical Engineering Connect Day: CEB connecting Arkwright Scholars with chemical engineering

James Alterman, Head of Business Development at The Smallpeice Trust

A total of 32 students (21 Female, 10 Male, 1 Non-Binary) participated in the Arkwright Engineering Scholarship’s Connect Day hosted by CEB in collaboration with the Smallpeice Trust.

An Arkwright Engineering Scholarship is the most esteemed scholarship of its type in the UK, designed to inspire students to pursue their dreams and change the world as a future leader in engineering. Due to the ongoing pandemic the day was delivered virtually. On the day scholars attended a variety of sessions focusing on careers in Chemical Engineering and the life of a Chemical Engineering undergraduate at the University of Cambridge. Students also benefitted from lab demos and were given the opportunity to ask questions to current undergraduate students.

All participating students reported that they enjoyed the event and would like to do something like this again. Furthermore, the participating students reported that as a result of the day they understood more about Chemical Engineering and would consider a career in the field. Students were grateful to learn about the admissions process and the college system at Cambridge.

Positive comments from students included. "I found the presentations informative particularly on the admissions process. This is very useful as with Covid19 there are no open days and making a big decision with lots of information from a university I am interested in is very helpful" and "I particularly enjoyed the video on the labs, seeing the microscopes and people working on various projects. I think this really helped to get a sense of how things work and was really useful. The whole connect day made me consider chemical engineering a lot more, having arrived with little interest in it initially".

The Smallpeice Trust would like to express its thanks to the Department of Chemical Engineering and Biotechnology for hosting such a fantastic event and we hope to develop the programme further in the future and benefit an increasing number of students.


What is Chemical Engineering and what do Chemical Engineers do?

Dr Andy Sederman

Department of Chemical Engineering and Biotechnology

Presentation from Dr Andy Sederman, Director CEB of Teaching, Chemical Engineering Connect Day on 31 March 2021: What is chemical engineering and what chemical engineers do.

Article continues on page 25
CEB rocks at the first virtual Cambridge Festival!

CEB took part on the new, and first virtual, Cambridge Festival, which drew a larger and varied online audience from Cambridge and beyond tuning into one of our exciting and engaging events on offer.

The inaugural Cambridge Festival has been a remarkable success delivering events online to a global audience. We were able to share the wonderful work of the University and its partners, through over 350 free, online events across ten days.

CEB had the honour to deliver 8 of these events to delight a ‘knowledge-hungry’ audience: we offered a talk on organs-on-chips and how these are shaping up the way new medicines are developed, and another one on sensors and their applications.

Our researchers presented a live demo of how digestion works in the stomach, demonstrated the effect of CO2 on global warming, and hosted a fascinating panel discussion with our incredible panel of scientists, journalists, filmmakers, and social scientists to find out how making biotechnology tools accessible to all could impact our world. They also showed the effect of greenhouse gases on global warming and shared their work on harnessing energy from ammonia as the ‘fuel of the future’ to meet the needs of powering our world whilst reducing the impact of climate change. We also had an ‘Ask our engineers and scientists’ session with our researchers answering pressing questions from the audience.

We even offered a self-guided, covid-safe ‘Energy Research Walking Tour’ giving attendees the opportunity to go on a self-paced walk around the West Cambridge site and listen to interesting snippets detailing the wide variety of energy research on offer. Overall, there was something for everyone!

Overall, with well over 100,000 views from 173 countries during the Festival period has made this event, in its inaugural year, the largest and most successful University of Cambridge Festival ever and one of the UK’s most successful online festivals in the last year. This number is also expected to grow as people continue to watch the various talks that have been uploaded to the University’s YouTube channels.

The response to our digital content has been positive and will bring you the best of both, live and online, in 2022. It has been an incredibly unique year to launch a new festival, and to meet all the new challenges that working remotely has brought. However, it is hoped that the Cambridge Festival will be back live across Cambridge with some in-person interaction next year (covid permitting!) and CEB will again be there showcasing our efforts to tackle the biggest challenges in sustainability, energy and environment and healthcare. We would like to take this opportunity to thank all our department contributors and our global audience.

If you missed any of the virtual events hosted by CEB you can catch up on www.ceb.cam.ac.uk/camfest and or check out our own YouTube channel playlist www.youtube.com/playlist?list=PLev6-TQAhs佐vAGZGwgf1-3PXJwMr00r

Source: www.festival.cam.ac.uk

Helping to raise eating disorder awareness at CEB

The first week of March was national eating disorder awareness week. Our researcher Sarah Barron lead a series of events, together with like-minded students, in order to help raise awareness, reduce stigma and offer practical advice for sufferers and their families.

Approximately 1.25 million people in the UK have an eating disorder and over lockdown the UK has seen a 73% increase in people accessing services. Eating disorders are crippling mental illnesses and can affect people of any age, size, race and gender (25% of sufferers are male). There are five main types of eating disorder, Anorexia, Bulimia, Binge eating disorder, Avoidant-restrictive food intake disorder (AFRID) and Other specified feeding or eating disorder (OSFED) but this year, eating disorder awareness week focused on raising awareness of binge eating disorder. Our researcher Sarah Barron, along with fellow Cambridge students James Downs and Naomi Wilcox, organised a week of virtual events including an educational webinar with the UK eating disorder charity (BEAT), a wellbeing yoga class and promoted the launch of a local new podcast (Full of beans) hosted by Hannah Hickinbotham which aims to reduce stigma and raise awareness of eating disorders. The week programme had over 60 attendees and the team raised over £600 for BEAT, with funds going to keeping hotlines open, running support groups, providing resources and campaigning. For more information contact Sarah [sib222@cam.ac.uk], search ‘full of beans podcast’ to listen or visit the BEAT website below.

Source: www.beateatingdisorders.org.uk
CEB supporting International Women’s Day

CEB organised an interactive virtual panel discussion event on International Women’s Day (IWD) on 8 March, led by our HoD Professor Clemens Kaminski, other academics, researchers and students at different stages of their careers. They not only celebrated female achievements in STEM, but also discussed and challenged gender stereotypes and bias.

Steered by panel moderators Professors Sabine Bahn and Róisín Owens, the event kicked off with Professor Owens highlighting the importance of not just sharing successes, but also failures, encouraging women to feel able to fail in a safe environment, which she felt was possible in academia. Some colleagues then shared their personal experiences of successfully balancing motherhood with a career in academia. It was noted that a focus on ‘maternity leave’ created pressure on women, who often feel they have to put their career on hold when having a family and with children generally having greater dependence on the mother. Expectations about who will take parental leave and which partner has a better-paying job also seem to work to the detriment of women and their careers. The panel agreed increased income and support for those taking parental leave, whether men or women, is required.

Several male members of the panel mentioned that their partners seemed to have more responsibilities at home with regards to the care and upbringing of children and there were calls for an equal, fair share of workload and responsibilities in this area. The negative and damaging connotations associated with words used by both men and women to define women were also pointed out such as describing women as “hard working” and men as “accomplished” or “talented”. Women can also often be unaware that they may be undermining their own talents by passing it off as just “working hard”.

Culture, upbringing, and personal experiences were noted as important factors determining the way women see themselves and the way others view them, which often affects self-confidence.

The issue of equal pay was also raised, with women in some sectors still being paid less than their male counterparts in the same job, although panellists agreed that academia seems to be more supportive but there is still some work to do.

Some other panellists commented on the positive influence of role models they have had in their careers so far, which was seen as necessary for change and to help dispel myths about women in STEM careers and challenge gender stereotypes and bias.

Dr Nayra Martin-Key, one of CEB’s researchers and Wellbeing Advocates, commented: “It is not about equal pay for equal work, it is about being given the same opportunities as men. It is about transparency. When a woman has a child, her career suffers. Research shows that when a man has a child, he is more likely to get promoted.”

Some positive suggestions made after this event included, actively acknowledging and praising the work undertaken by women and changing the way academics write reference letters for female researchers by focusing more on their individual achievements and leadership skills. The panel agreed that despite positive changes in the right direction, equal rights between men and women in some areas are still being slow to manifest and there’s still much work to be done to dispel myths and empower women.

Source: IWD 2021 campaign www.internationalwomensday.com
CEB STEM ambassador, Sarah Barron, ‘Rising Wise’ to support women in STEM

RisingWISE is an established Oxbridge network inspired by EnterpriseWISE: designed by women, for women and delivered entirely by women. The programme Directors are Dr Shima Barakat, University of Cambridge and Dr Anne Miller, University of Oxford.

RisingWISE is an educational, team-building and networking course, taking place over four weekends. Participants are taught how to tackle challenges often faced by women in STEM and given the opportunity to listen and learn from a wide range of speakers who have taken career paths outside of the traditional academic role. RisingWise focuses on building self-confidence, working in interdisciplinary teams and exploring alternative ways of thinking and communicating.

Our researcher Sarah Barron was successful in securing a place for this year’s round of RisingWISE applicants and gives us her insights: “It has been a really enjoyable, inspiring and creative programme. It has been amazing to connect with so many diverse and inspiring women and to hear about the successes of those who have taken an entrepreneurial or industrial career path. I also got to meet with experts in scientific communication and authors of popular science non-fiction books, a personal passion of mine. I would highly recommend the course!”

Following on from Sarah’s enthusiasm for scientific communication, she was also a Cambridge finalist in this year’s FameLAB, the only international scientific communication competition, which took place on Friday 2 March!

Source: www.mpls.ox.ac.uk/training.enterprise/enterprising-women/risingwise-an-enterprise-course-by-and-for-women

Team AdMeliora are this year’s Davidson Inventors Challenge 2021 Winners! (Continued from page 22)

Their innovation was to use food waste to produce sustainable and biodegradable facemask. The team showcased a clear experimental plan including prototype production, anti-bacterial testing, the implementation of consumer feedback and future directions and scale-up ideas. A big congratulations to team AdMeliora, who have won a behind the scenes trip to Amazon, courtesy of our alumnus Dr Rachel Cooke. A big thank you to all of our panellists, judges and guest speakers for making the event happen and to all the teams who entered! All teams should be very proud of themselves, and we look forward to welcoming them to Cambridge in the future!

IChemE President Stephen Richardson said: “On behalf of IChemE, many congratulations to the winner and all the finalists in this inaugural competition. I’m delighted to have been part of this awards ceremony.

“A past president of IChemE and a friend of mine, Professor John Davidson was an active member of the Institution, committed to the profession and passionate about teaching the future leaders of chemical engineering. Through your creative and innovative projects, you have demonstrated the importance of applying chemical engineering skills and thinking to find sustainable solutions to problems that we all face around the world today. I am sure that this would have made him very proud. I hope you will consider this exciting profession as a potential for your future career journey.”

Source: www.ceb.cam.ac.uk/news/davidson-inventors-challenge-final-winners
Chemical Engineering working towards Sustainable Development Goals

Adarsh Arun, PhD student in Chemical Engineering at CARES.

The Sustainable Development Goals (SDGs) framework was pioneered by the UN in 2015 and has quickly become the North Star in striving for a more sustainable, prosperous and peaceful future for all. Consisting of 17 goals with specific targets to achieve by 2030, attaining these goals will require international collaboration between the private sector, governments, societies and individuals. How can chemical engineering and the chemical industry do its part in achieving these goals? Let’s find out!
### Sustainable development goals

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<tr>
<th>Sustainable development goals</th>
<th>Role of chemical engineering and the chemical industry</th>
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<td><strong>7 Affordable and clean energy</strong></td>
<td>The chemical industry is crucial in ensuring access to reliable energy for all and at the same time, transitioning towards a lower carbon society and taking climate action by improving uptake of renewable energy, and designing more energy efficient processes. We have seen this already in this issue with green ammonia as an energy vector and chemical looping of biomass with carbon capture. Other advancements in fuel cells, solar panels, batteries, and nanomaterials all require and depend on innovations in chemistry and chemical engineering.</td>
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<td><strong>9 Industry, innovation and infrastructure</strong></td>
<td>The chemical sector has a lot to offer in the area of clean water, climate action, and safeguarding life below water. Advancements in waste water treatment require innovations in filtration and membrane technologies and, undoing most of the damage caused by plastics polluting our oceans and seas will require innovations in plastics recycling technologies as well as biodegradable substitutes. The chemical sector will need to adapt, transform and lead this transition to a more circular economy.</td>
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<td><strong>2 Zero hunger</strong></td>
<td>Food is another area where chemical engineering and the chemical sector possess considerable “know-how”. Embarking on more sustainable agricultural practices, using more sustainable fertilisers, requiring less land to achieve greater agricultural productivity and yields, minimising food waste and producing chemicals from it, are all examples of technologies that will require innovations in chemistry and chemical engineering.</td>
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<td><strong>8 Decent work and economic growth</strong></td>
<td>Preserving human health is more important than ever before as the pandemic rages on. Chemical engineering and the chemical sector are crucial in vaccine development and scale-up, and in the development of life-saving drugs and illnesses. It will take continuous innovation by the pharmaceutical industry and researchers to continue pushing towards a healthy and sustainable future.</td>
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