

Department of Chemical Engineering and Biotechnology

www.ceb.cam.ac.uk Lent 2018 Issue 23

> **CEB prepares for Strategic Research Review 2018**

CEB Focus

Message from HoD, Professor John Dennis



The new Vice Chancellor of the University, Professor Stephen Toope, visited the Department on 15th December, 2017. The purpose of the visit was to show the Vice Chancellor the new building and to give him an appreciation of our research activities. He was shown around the laboratories and given short presentations by researchers on a selection of projects with potential for substantial impact. The standard of the presentations by each researcher was very high and clearly enthused the VC. Also in December, one

of our graduates from Part IIB, Cameron McCormack, received a Salters' Graduate Prize for Chemical Engineering. The Prizes, awarded by The Salters' Institute, were established to encourage able students of Chemistry and Chemical Engineering who show the potential to occupy leading positions in public life. either by employment in the Chemical or related industries, or more generally in employment that supports the industrial life of the UK. Cameron joins a distinguished list of graduates of the Department who have received the Prize.

Two forthcoming events are also important. In March, there will be a Strategic Review of CEB's research, undertaken by a distinguished international panel of academics and industrialists. This is an extremely important event, because it will set the future direction, and mode of working, of our research. On 24 April, the new CEB building will be opened formally by the Chancellor of the University, Lord Sainsbury of Turville. Along with the opening, there will be activities displaying the breadth of our research and teaching activities, and their economic and social impact.

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EDITORIAL

Editorial Note

■ The Editorial Team wishes its global readership a fantastic 2018! We celebrate the arrival of the New Year with a revamp of the publication design. We hope you like the new refreshed look!

CEB Focus Newsletter is the product of a joint team effort led by Chief Editor Elena Gonzalez assisted by volunteer editors. We would like to thank former member Sukanya Datta for her contribution to the project

The back end of 2017 was certainly hectic at CEB. The Main Article focuses on preparations for the upcoming Strategic Research Review Panel visit coinciding with the December visit of Cambridge University Vice Chancellor, Professor Stephen Toope, taken on a tour around the department labs and engaging with researchers to find out more about CEB's research of impact and important breakthroughs made to tackle global challenges.

Graduate Hub features highlights such as the Global Young Scientist Award nomination for PhD student Theresa Maier and the Biomaker Prize award. Industry Business offers an overview of the latest exciting industry collaborations and developments and focuses on the visit of key industry partner Infinitus China.

Research Highlights features an overview of the latest papers published by talented department researchers and Research Impact tells about the main activities of the Bioelectronic Systems Technology research group led by CEB lecturer and researcher Dr Róisín M. Owens.



CEB Editorial Team: Chief Editor Elena Gonzalez (centre) with PhD students Sukanya Datta and Aazraa Pankan (far right) and undergraduate Bahumi Motlhanka and CUCES Undergraduate Publicity Rep Felix Laing (far left).

CEB Innovation features the latest technology developments and innovation wins, a new CEB spin -out, Cambridge Sensor Innovation, and an account by Jennie Flint at Cambridge Enterprise of what intellectual property really means. In CEB Women, Sandra Crawford tells of her experience as a County Councillor in Cambridge beyond her Accounts duties at CEB. Among some of the latest noteworthy Achievements are Professor Silvana Cardoso's election to the Editorial Board of CEJ, the L'Oréal-UNESCO for Women in Science Fellowship for Anna-Maria Pappa and Noha A. Al-Otaibi's Excelling Student Award by HRH Prince Mohammed bin Nawaf Al Saud.

Alumni Corner focuses on alumni wins for Dr Darrin Disley and Dr Can Lam. Staff Room features highlights of public outreach with staff presence at the Postgraduate Fair and the Staff Xmas party.

Finally, Department Events offers a review of previous highlight events and more information on the New Building Official Opening on 24 April 2018. Registration for all invited supporters and academic and industry partners is now open on <u>www.ceb.cam.ac.uk/about/</u> westcambridge/official-opening

Special thanks to webmaster Vanessa Blake for regularly providing photos, and to department members, alumni and partners in industry and academia for sending article ideas and contributions.

If interested in joining the Editorial Team and/or would like to have an active role in the quality of the editorial content and the design of the publication, please email us on <u>ceb-focus@</u> <u>ceb.cam.ac.uk</u>

FRONT COVER ARTICLE



Martin Chan (second on left), from the Combustion Group, demonstrated a lab scale model of a fluidised bed, to show the phenomenon of fluidisation and how bubbles can form and behave. Matthias Schnellmann (right) then talked about their application in Carbon Capture and Storage (CCS) technologies such as Chemical Looping Combustion.

CEB prepares for Strategic Research Review 2018

Elena Gonzalez

Preparations are underway for the upcoming visit of the CEB Strategic Research Review Panel on 20-21 March 2018.

The University of Cambridge has established a programme of Strategic Research Reviews in order to safeguard and develop the long-term quality of the University's research efforts and outputs. In commissioning the reviews, it hopes to be better placed for the next Research Excellence Framework REF 2021 assessment, and also to maximise any opportunities presented and address any challenges that Departments may face in achieving research quality and impact.

AS part of this review programme CEB research and outputs will be evaluated by an external panel of experts. To facilitate this task, the CEB Strategic Review Committee was formed last year, which comprises of 10 leaders of academia and industry:

- **Professor Andrew Livingston** (Imperial, former HoD)
- Professor Ian Metcalfe (University of Newcastle)

- Professor Anton Middelberg (University of Adelaide, Dean of Engineering) – Chairman
- **Professor Guy Marin** (University of Ghent)
- Dr Gary Smith (CEO, INVISTA UK)
- **Professor Ed Cussler** (University of Minnesota, former HoD)
- Dr Mark Treherne (CEO, Talisman Therapeutics)
- Dr Paul Varley (MedImmune, Cambridge)
- Professor Antje Baeumner (Universität Regensburg).
- Professor Sue Harrison (University of Cape Town)

CEB senior academics have been regularly meeting with Dr Rebecca Aarons, Research Strategy Analyst at the CU Research Office, who has been regularly providing input on the department strategy and advising leading academics on the next steps to be taken.

This review also involves a series of meetings with members of the CEB research community. The timetable is designed so that a cross-section of the

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community has the opportunity to contribute over the course of the panel's visit in March, including the Head of the Department, Professor John Dennis, the Director of Research, Professor Lisa Hall, and other University Teaching Officers (UTOs), postdoctoral researchers and research students.

CEB academic leaders and researchers have been working hard in the background to help shape and develop the department research strategy, reviewing current activities and key impact areas, looking at critical mass areas to guide the future direction of research. CEB's own Research Committee has also been recording and evaluating all the interactions between different research individuals and groups and across different disciplines within CEB and beyond, nationally and internationally.

Whilst dealing with ongoing preparations for the panel visit, CEB also welcomed the timely visit of the University Vice-Chancellor (VC) Professor Stephen Toope on 15 December 2017. The high profile visit was a good trial as academics and young researchers tested their presentation skills and the impact of their work and research activities on an external audience.

Professor Toope was treated to a tour of the labs and he enjoyed engaging with PIs and young researchers from different research clusters. They very enthusiastically shared research highlights, important breakthroughs and the progress made in their studies. They presented an overview of key experiments being undertaken. They also very confidently answered questions the inquisitive VC had about their work.

The VC had previously visited the Department in September just after taking post. He was rather impressed by the amount of expertise being housed under one roof and the breadth of exciting and multi-disciplinary research work being carried out in CEB's hub of vibrant activity. Professor Toope commented; "It's been fascinating to see the breadth of multidisciplinary research that is happening in the Department of Chemical Engineering & Biotechnology – I look forward to seeing more world-changing discoveries and innovations from the department in the future."

It is somewhat expected that some of the key projects and experiments presented to the VC will also be shared with the Strategic Review Panel members. As part of the programme of their visit, they will be treated to brief presentations on key research themes, mini talks, lab demos and be shown a diverse range of research impact cases and stories with a tangible positive benefit on society and the economy.

As CEB finalises the programme of this important visit, the Department also prepares for its highlight event of the year, the Official Opening Ceremony of its new building in West Cambridge on 24 April 2018, when the Department will be welcoming a much larger stakeholder audience. We then look forward to sharing our academic and research highlights and achievements with our supporters, partners and friends, old and new. The future looks hectic but certainly bright!



Young researcher Cassi Henderson (far right), from the Cambridge Analytical Biotechnology group led by Lisa Hall (next inset), with HoD Professor John Dennis (centre), with department members and visitors from the Vice Chancellor's office sharing her work on the integration of functional materials, assay development and manufacturing design to enable diagnostics to be produced for affordable, rapid, and point-of-care detection of diseases.

UNDERGRADUATE FOCUS



CUCES Christmas Dinner

Felix Laing, CUCES IT & Publicity Officer 2017-18

■ On the evening of Thursday 23 November, CUCES took over Cambridge's best dining establishment for the annual Christmas dinner. More than 70 students, including undergraduates from all years and several postgraduates, dressed up smart and congregated at Browns restaurant for an evening of fine dining and responsible drinking.

Prior to the arrival of guests, the CUCES committee worked hard to decorate the tables with glitter, Christmas crackers and festive name place cards. Between 7:00 and 7:30 p.m., guests were greeted at the door with complimentary sparkling wine, shortly before heading to the tables for the meal ahead. Browns provided an extensive menu for us this year, giving plenty of choice to those who didn't fancy the traditional turkey dinner, those with special dietary requirements, and those who understandably dislike Christmas pudding. The three-course gourmet meal was enjoyed by all, and many also enjoyed a full or half bottle of premium wine. A special discounted cocktail list, as organised by Social Secretary Hannah Bryson-Jones, also proved very popular throughout the evening. The meal was capped off with a visit from Father Christmas himself (a.k.a. Part I Representative Rob Walker in a onesie), who handed out treats to all the guests, as has become tradition in recent years.

Unfortunately, the night had to come to an end at some point, and indeed it did, at around 9:30. Everyone left the restaurant thoroughly satisfied, and set off in their various directions to finish off the evening in whatever way they saw fit.

CUCES would like to thank everyone who attended for making the event such an enormous success. It was a perfect way to celebrate coming to the end of a difficult term, and to usher in the long and relaxing holidays ahead.

Frank Morton Sports Day Returns

FEDS

The Frank Morton sports day is an annual event held for Chemical Engineering students across the UK and Ireland. It was conceived in 1961 by Professor Frank Morton, who organised a football match between his Chemical Engineering Department at Manchester and that of his previous University, Birmingham. Since then the event has grown astronomically, attracting more than 30 universities to compete in sports ranging from rugby to pool to Quidditch.

The University of Leeds will host the 2018 games on Monday 12 February, and they have pledged to deliver "the greatest Frank Morton yet". In their bid for the event, Leeds promised more sports than ever before, including new additions such as crazy golf and sledging.

Due to the nature of this competition, which favours

Iarge departments who can field teams in many sports, Cambridge's relatively small cohort often struggles to compete with the giants of Loughborough, Manchester and Birmingham in the overall rankings. This time round, Cambridge will be looking to improve on last years performance by scoring at least one point in the overall competition. Our chances will certainly be improved by the addition of the new Part I students into the mix, who will be eager to prove themselves. In the meantime, our athletes are training hard and regularly to

ensure they are in peak physical condition for the event. With the right amount of passion, devotion and team spirit, we will surely obtain that hallowed point, and perhaps even more.

Will Cambridge end Birmingham's three-year winning streak and march to their first ever Frank Morton victory? Only time will tell.

Introducing the New Part I Rep

Rob Walker, CUCES Part I Rep 2017-18

■ For the past couple of months, I have been working as the newest member of the CUCES Committee and so it's probably time that I got around to introducing myself to the whole department. I'm Rob Walker, the new Part I Representative and one of the four ex-Natural Scientists from Pembroke to move across to the Department this year.

Michaelmas was a great start to the year and I've thoroughly enjoyed getting stuck in with the other members of the CUCES Committee to get all the different events we've got planned for this year organised, with Frank Morton and the Annual Dinner being the headline events for Lent Term.

Outside of CUCES, the first couple of months in the Department have been everything I'd hoped for and more. In particular, having everything you need under one roof within the new department has been terrific, even if the new site in West Cambridge is a little further than the 20m from my room in Pembroke to the old building on Pembroke Street! (I jest – as a cyclist, I quite enjoy the ride in and the 10am starts are also welcome!)

Furthermore, having come from natural sciences, where everyone seemed to disappear within 2 minutes of a lecture finishing, the daily tea break has also been fantastic for getting to know people both in my own year and those in the years above



and generally everyone I've met has been extremely welcoming and supportive.

Although I'd be lying if I said the Christmas Holidays haven't come as a welcome break, by the time the New Year comes around I think I'll be looking forward to getting back to CEB and starting another jam-packed term - there's certainly a lot to look forward to.

GRADUATE HUB

Biomaker Challenge: Open-source Hardware to build Low-cost Instruments



Participants of the Biomaker Challenge

■ Over the summer, the Synthetic Biology Initiative and the CamBridgeSens Network brought together students and researchers to apply open-source technology to biological problems, espscially to build low-cost sensors and instruments for Biology. Forty teams took part in this "Biomaker Challenge", with expertise in Biology, Biochemistry, Chemistry, Physics, Chemical Engineering, Computer Science and Engineering. Team sizes ranged from two to twelve members. While the majority of teams was from Cambridge, the Biomaker Challenge reached out to plant scientists from Norwich and students at the Royal College of Art.

The teams were given an Arduino microntoller starter kit, including a number of sensors and a touch screen display, which served as a catalyst for their ambitious projects. For many participants this was the first time they would build their own electronic circuits - and for the electronics enthusiasts it was probably the first time they would think about a biological problem. You might have heard about the Raspberry Pi minicomputer, which is aimed at the education sector to introduce children to programming. Arduinos are even more stripped down "computers", which can be programmed to carry out simple tasks, for example collecting and storing data and controlling instruments, such as stepper motors or pumps. There is a growing community of researchers, including in CEB, who use these low-cost devices (~£20), instead of commercial products costing 10-100 times more, to control their experimental setups.

The project outcomes of the Biomaker Challenge were demonstrated during the Cambridge Open Technology Week in the Department of Engineering. Thanks to the interdisciplinary character, the outcomes of the challenge were truly exceptional with many working prototypes tackling problems in Biology. Prizes were awarded in the categories of best technology, best biology and best maker spirit for a low-cost chromatography system for protein purification, a rodent physiology monitoring bed for pre-clinical experiments and a focus stacking system for macrophotography of developing ferns.

Chariots of Fire for Alzheimer's Research

Chariots of Fire is a famous relay race, which raises money for Alzheimer's Research UK. The race

Sensors Day 2017- A Showcase of Multidisciplinary Sensor Research

The third Sensors Day Conference, of the Centre for Doctoral Training in Sensor Technologies and Applications, took place on 20 October 2017 at Robinson College. More than 180 researchers from academia and industry attended the event.

The conference attracted a line-up of internationally recognised speakers, which included Allard Mosk, Marina Kuimova, Tuomas Knowles and CEB very own Ljiljana Fruk. The latter delivered an interesting talk on the use of gold nanoparticulate technology for novel sensor applications.

The pinnacle of the day was the presentation of the student team challenge, which is a 12 week research project undertaken by the Sensor CDT students, as part of their Masters of Research (MRes). This year's challenge was to develop a cellfree sensor kit for the quantitative testing of arsenic



Attendees of the Sensors Day, including the Sensor CDT Cohorts

contaminated groundwater in developing countries.

Besides talks and posters, the students learned from a panel of young entrepreneurs on how starting a company works in practice.

www.ceb.cam.ac.uk/news/news-list/sensorsday-2017_

www.cdt.sensors.cam.ac.uk/news/sensors-day-2017

GRADUATE HUB



Ajay Mishra, Miranda Robbins, Nadva Nespovitava, Amberlev

Stephens, Nathan Curry and Pedro Vallejo Ramiraz (left to right) course is 1.6 miles long, starting at Queens' Green and passing along Trinity, King's and Clare College.

On Sunday 17 September 2017, Nathan Curry and Pedro Vallejo Ramirez, from the Laser Analytics Group, together with Amberley Stephens, Nadya Nespovitaya, Ajay

Nadya Nespovitaya, Ajay Mishra and Miranda Robbins from the Molecular Neuroscience Group participated in the annual race.

Braving the cold foggy morning, the group completed the race in one hour and 12.5 minutes, finishing 32nd out of 215 mixed teams and 87th out of 333 overall. They raised a total amount of £290 to back an important research project at the University of Cambridge, which analyses why people with Down's syndrome develop Alzheimer's.

www.ceb.cam.ac.uk/news/news-list/chariots-of-firefor-alzheimers-research

Global Young Scientists Symposium 2018

Theresa Maier, WD Armstrong Scholar & PhD Candidate in BioScience Engineering and Bionanotechnology Groups



■ I was very fortunate to be selected as a participant of the Global Young Scientists Symposium (GYSS) 2018. It is a prestigious international gathering of young scientists, being held from 21 to 26 January 2018 in Singapore. In a multi-stage selection process, I was nominated in the first instance by the School

of Technology, then selected by the Pro-Vice Chancellor of Research, Professor Abell, as one of five candidates from the University of Cambridge to be put forward for University-wide nomination. I was lastly chosen from those five nominations by the National Research Foundation in Singapore/ GYSS as a participant.

"I am tremendously grateful to be able to represent the University of Cambridge at this year's Global Young Scientist Symposium. It is such a privilege to be contributing towards the global discussion on the creation of technologies for a better world and to advocate the necessity of sustainable and low-cost solutions for those in need. I, in particular, CEB GRSoc Formal at Magdalene College on 27 November 2017



Graduate Research Society 2017-2018

Diana Vulpe, PhD Student and President of Graduate Research Society

■ The 2017-2018 GRSoc Committee is now fully commissioned! We are here to ensure that the Graduate Students in our Department are well looked after, both from a wellbeing perspective and, of course, academically. The previous committee has put significant effort towards the establishment of a yearly Graduate Student Survey which has received an overwhelming turnout - we have addressed the outcomes of this survey to the Student Staff Consultative Committee and, hopefully, the most concerning of issues have been given adequate answers. Please do not hesitate to approach and speak to us!

So far, with great success, we have put together the first in-house CEB GRSoc Quiz as well as this academic years' first GRSoc Formal at Magdalene College, both events were excellently attended and we are looking forward to putting together even bigger events in the upcoming term.

Special thanks go to second year PhD Student, Walter Kähm, who has committed to organising weekly Graduate Student Talks so as we could all gain experience with an audience and receive on-the spot feedback on our performance. These talks are held every Wednesday at 3 pm in LT3 and run for approximately 30 minutes including Q&A. We encourage everyone to attend and subscribe to give talks in such a friendly and encouraging atmosphere.

Last but not the least, stay tuned with the upcoming Graduate Student Conference during Easter Term!

hope to direct more visibility to the global need for innovation in paediatric healthcare, as well as to solutions suitable for use in low-resource settings. I am looking forward to the unparalleled opportunity to engage with globally recognised scientific leaders and outstanding participants from all over the world, while emphasising the importance of harnessing innovation to address major global challenges."

TEACHING MATTERS

Latest Salters' Graduate Winner

Cameron McCormack is one of the 2017 recipients of the Salters' Graduate Prize for Chemical Engineering. The prestigious annual event was held on 8 December 2017 at the Salters' Hall. The award ceremony celebrates high levels of excellence within the science education sector.



Cameron McCormack (centre) with Lord David Willetts (former Minister of State for Universities and Science) and Rev Prof Michael Reiss, Master of The Salters' Company 2018 (right)

"I was delighted to be awarded a Salters' Graduate Prize this year, following my recent graduation from the Department. This was a fantastic way to end four great years in Cambridge - my thanks must go to everyone I worked alongside and to Professor John Dennis and Dr Patrick Barrie for

nominating and advising me with respect to this award. I am now working as a process engineer for Wood (formerly Amec Foster Wheeler) in a design role, and hope to continue in the chemical industry for many years to come."

Moreover, in 2018, the Salters' Institute will be celebrating its Centenary. The Centenary gives

the Institute a focus to celebrate the Institute's history and the impact of its current activities; to redefine its relationship with the chemical industry and to develop new initiatives, one of which is a network for Salters' Institute Alumni.

To begin this network, the Institute is contacting its previous Award winners to find out where

their careers have taken them since winning an

Award and to get involved in the Institute's Alumni events.

So far an event has taken place in London and Edinburgh. As part of the Centenary year, plans are underway for an event at Salters' Hall in April 2018.

www.saltersinstitute.co.uk/

Teaching Excellence Framework (TEF)

Dr Patrick Barrie. Deputy Head of Department (Teaching)

Most of you will be aware of the Research Excellence Framework (REF). This is an assessment of "research" (including "impact") of UK Universities

every six or seven years. It has a large impact on the funding awarded by the government to the University and on the reputation of the Department.

The REF has now been joined by a Teaching Excellence Framework (TEF). TEF is a government initiative that aims to recognise and reward excellence in teaching, learning and outcomes, and to help inform prospective student choice.



Teaching Excellence Framework

Despite its name, TEF does not really measure "teaching" nor "excellence". Instead it considers graduate employment data, student retention data and student opinion (based on the National Student Survey), together with an institutional description of

the education and student support available. In June 2017, the University of Cambridge received a Gold Award in TEF, the highest available.

The Department of Education is now conducting subject-level TEF pilot studies. These results will not be published, but will be used to inform a possible new TEF from 2019 or later. It is considering having separate TEF awards for Engineering, Natural

Sciences, Medical Sciences, Social Sciences, Business & Law, Arts and Humanities, rather than a single award for the University.

TEF already has some financial implications – the government requires a satisfactory result before it allows Universities to increase student fees. The impact of TEF on reputation is likely to grow, particularly if it becomes a subject-level award.

Current undergraduates may find themselves part of the ongoing pilot studies for a subject-level TEF. If you are asked to complete a survey on teaching intensity, then please do so. It might even make a difference on whether the next TEF uses sensible or nonsensical metrics.

The surprising mechanical Properties of Polymer Glasses: strengthening the constituent chains can weaken the bulk material

Dr Chris Ness, Dr Alessio Zaccone Statistical Physics Group



■ Intuition tells us that if we strengthen the component parts of a material, we will strengthen the material itself. Writing in the Rapid Communications of Physical Review E, Chris Ness, Alessio Zaccone and coworkers Vladimir Palyulin and Rico Milkus from the Statistical Physics Group at CEB

successfully demonstrated that this is not always the case. In a close collaboration with Dr Tim Sirk and Dr Robert Elder from the US Army (generously providing funds and computational resources for this project), they studied an example of amorphous polymer by means of molecular dynamics simulations. They showed that stiffening the bending of constituent polymer chains frustrates the packing and leads to a density reduction that in turn weakens cross-chain interactions. The combined effect of intra-chain strengthening and interchain weakening actually leads to an overall non-monotonic variation of the shear elastic modulus. This surprising result means that, under certain circumstances, more rigid polymer chains can lead to weaker bulk materials. The computational results are in agreement with state-of-the-art theory for computing the mechanical properties of disordered solids, based on the framework of nonaffine lattice dynamics developed in the Statistical Physics Group at CEB.



(a)snapshot of simulated amorphous polymer; (b) schematic of chains showing crosschain interaction (blue) and chain bending (red); (c) schematic showing nonmonotonic variation of shear modulus. highlighting the shear modulus minimum at intermediate

These findings pave the way for an analytic description of amorphous polymers starting from the atomistic level. Amorphous polymers represent an important class of materials and accurately linking their chemical formulation and their mechanical behaviour is essential for technological applications across industry and defence. Furthermore, the new effect discovered in this study might be much more general and may show up also in the mechanics of other soft materials such as colloidal gels (where bending can be tuned by controlling the adhesion area between colloidal particles) and granular systems where "granular polymers" have recently emerged as a new class of granular materials.

Black Smokers and Lost City Vents

Professor Silvana Cardoso

■ Fluids and Environment GroupIn the depths of the oceans, hydrothermal vents produce spectacular structures. The deposits consist of spires that can reach 10m in width at their tops and delicate flanges adorn their sides. Black smokers and Lost City-type springs are varieties of these hydrothermal vents. Black smokers emit hot, acidic water and





Hydrothermal vent study area with black smoker and bright red-tipped tube worms. Credit: IFE, URI-IAO, UW, Lost City Science Party; NOAA/OAR/OER; The Lost City 2005 Expedition

Lost City-type springs emit cool, alkaline water. In a recent paper in the Proceedings of the Royal Society A, Drs Silvana Cardoso and Julyan Cartwright discuss vents. While both produce precipitation structures as the issuing fluid encounters oceanic water, Lost City type hydrothermal vents in particular have been implicated in the origin of life on Earth.

The paper presents a parallel-velocity flow model for the radius and flow rate of a cylindrical jet of fluid that forms the template for the growth of a tube precipitated about itself and compares the solution with previous laboratory experimental results from growth of silicate chemical gardens. It shows that when the growth of the solid structure is determined by thermal diffusion, fluid flow is slow at the solidliquid contact. However, in the case of chemical diffusive transport, the fluid jet effectively drags the liquid in the pores of the solid precipitate. These findings suggest a continuum in the diffusive growth rate of hydrothermal vent structures, where Lost City-type hydrothermal vents favour contact between the vent fluid and the external seawater. The paper explores the implications for the road to life.

Future Materials: An old Classic Reinvented

Dr Ljljana Fruk, BioNano Engineering Group



Cellulose, the most common organic molecule on this planet, is a sweet polymer composed of hundreds of glucose units and present in the cell walls of all of green plants, many forms of algae and the oomycetes (fungus-like eukaryotic microorganisms and notorious plant pathogens). Cellulose makes around 33% of all plant matter, with 90% and more present in cotton, and usually 40-50% in wood. It is therefore not surprising that cellulose was one of the materials that changed the way humans live or our civilisation develops. Cellulose-based materials not only improved the quality of life by providing materials for shelter and clothing (first reports on spinning cotton were found in Egypt and India and stem from around 3000 years BC), but also contributed to the knowledge and culture (paper, books). Celluloid, thermoplastics made of cellulose and camphor, and first developed in 1856, went on to revolutionise photography and filmmaking until it was replaced with the easierto-handle acetate films in 1950s. These celluloid films were in fact highly flammable and difficult to produce, making the transport and use of the movie reels rather complicated.

Researchers and engineers have realised that cellulose, being an abundant polymer continuously produced in nature and easily degraded into smaller sugar, and eventually into glucose, is clearly a material with huge potential. It is strong and stable: it can survive up to 320°C and 25 MPa pressures (our atmospheric pressure is around 0.1 MPa) and it is stable in various extreme environments such as those created by strong acids. However, when more controllable intelligent materials need to be designed, plantderived cellulose is not the best candidate for manufacturing. The process of obtaining clean and crystalline cellulose, needed for applications in sensing or medicine, is time consuming, expensive and messy, as it requires removal of all other materials that come together in complex living systems such as plants.

The solution to this problem comes in the form of bacterial cellulose, which is produced by several types of bacteria. Some bacteria produce it to simply get rid of the rubbish, others to be able to stick to plants (some others are still unknown). Cellulose can be easily harvested, produced in large fermenting tanks and more importantly, when isolated, it is pure and often crystalline. Bacterial cellulose is a material that continues to surprise us and, if prepared carefully, it has piezoelectric properties and can produce electricity under pressure. Due to the nanostructured motifs, it can also change colours depending on the motif and it also has water-binding capacity. Incidentally, the latter property makes this cellulose type very appealing for tissue engineering and cell culturing. The very first primitive artificial skins have already been made, and it would not be difficult to imagine cellulose skin implants in the near future, doped with tiny sensors that report on our physical state and alert us at the first sign of disease and administer the right dosage of a drug.

The future is already here, and a material of the future might as well be one we thought we knew so well but still able to surprise us! It is a cellulose (and not the celluloid!) love story.

More information on Dr Fruk's research activities on <u>www.fruk-lab.com</u>

Wet bacterial cellulose



Bacteria making cellulose



Dry bacterial cellulose Lent 2018 Issue 23 | **13**

Bioelectronics Systems Technology at CEB

Dr. Róisín M. Owens, CEB Lecturer and 'BEST' Group Leader

■ The Bioelectronics Systems Technology group (BEST) has recently relocated to the department of Chemical Engineering and Biotechnology at the University of Cambridge. Previously in the south of France, the group is very excited to be focusing on new areas at the cutting edge between engineering and biology. We have had an intense couple of weeks settling in to life in Cambridge, preparing the laboratories and making new friends and colleagues. Our start has been made very much easier by the wonderful support from the staff, faculty and students in the department.

Figure 1 summary of technologies for metabolite sensing that benefit from organic electronic materials. Figure from Pappa et al TIBiotech 2018 from a recent review published in Trends in Biotechnology (A-M Pappa, O Parlak, G Scheiblin, P Mailley, A Salleo, R M. Owens. "Organic Electronics for Point-of-Care Metabolite Monitoring". Trends in Biotechnology DOI: 10.1016/j.

tibtech.2017.10.022

Besides getting to know everyone we have been hard at work getting things ready in the laboratory. Our research is focused on bioelectronics, interfacing novel electronic devices with cells. We are interested at the fundamental level in understanding how electronic materials act at the interface with biological materials.

Most of our work understanding the fundamentals of the biotic/abiotic interface has focused on the use of organic electronic materials, specifically conducting polymers. For a whole host of reasons, including better matching of mechanical properties to biological molecules, similarities in terms of chemical composition, and the ability to convert ionic signals to electronic signals, organic electronic materials are emerging as extremely viable alternatives to traditional electronic materials such as silicon or noble metals. This is particularly well illustrated for the generation of metabolite sensors



Figure 1 summary of technologies for metabolite sensing that benefit from organic electronic materials. Figure from Pappa et al TIBiotech 2018 from a recent review published in Trends in Biotechnology (A-M Pappa, O Parlak, G Scheiblin, P Mailley, A Salleo, R M. Owens. "Organic Electronics for Point-of-Care Metabolite Monitoring". Trends in Biotechnology DOI: 10.1016/j.tibtech.2017.10.022

RESEARCH IMPACT 💈

(e.g. glucose, lactate, dopamine) which can benefit from these materials properties for wearable or disposable or more sensitive diagnostics. We have summarised this emerging field in our brand new review published in Trends in Biotechnology (DOI: http://dx.doi.org/10.1016/j. tibtech.2017.10.022).

Typically, we integrate our organic electronic materials into devices known as transistors. In terms of interfacing with biological systems, the transistor provides the opportunity to amplify signals that can often be of low magnitude. Our device of choice is the organic electrochemical transistor (OECT) that facilitates intimate coupling of the biological and electronic materials. We work very closely with collaborators in Cambridge (Professor Malliaras) and internationally (Stanford, KAUST, Northwestern, Linköping) on these devices and have recently collaborated on a comprehensive review on the OECT published in Nature Materials. (published online 16 January 2018, doi:10.1038/natrevmats.2017.86).

The fundamental understanding we have acquired thus far helps us to design better devices for monitoring and hosting cells in vitro. We are particularly motivated to develop more physiologically relevant biological models that combine the use of human cells, grown in 3-dimensions, as a more accurate representation of human tissues and organs. We are integrating these models with our devices so that we can generate systems to enable drug discovery and reduce our reliance on animal models that are often not predictive of the human situation.

This research is central to a newly funded European Research Council project called 'IMBIBE: Innovative technology solutions to explore effects of the microbiome on intestine and brain pathophysiology'. Alterations in the microbiome have been linked with many disease phenotypes including colorectal cancer, Crohn's disease, obesity, diabetes as well as neuropathologies such as autism spectrum disorder (ASD), stress and anxiety. Animal studies remain one of the sole means of assessing the importance of microbiota on development and well-being, however In vitro models have developed at an accelerated pace in the past decade, benefitting from advances in cell culture, increasing the viability of these systems as alternatives to animal testing. We will be the first to develop an in vitro model of the gut-brain axis with



Figure 2 Confocal microscope images of neurospheres containing neurons (green) and astrocytes (red). J.Pas, et al. "Enhancing electrophysiology recordings with neurospheres via patterned PEDOT:PSS microelectrode arrays". Advanced Biosystems (2017) doi: 10.1002/ adbi.201700164

microbiota using engineering and materials science approaches to develop complete (i.e. human and microbe) models to truly capture the human situation. The result from this project will be a platform to study hostmicrobiome interactions and consequences for the pathophysiology of the GI tract and brain.

The success of the IMBIBE project will rely on our previously developed expertise in 3D models monitored using organic electronic devices such as those shown below in our recently published article.

Going hand in hand with our interest in the microbiome, we are working on a novel OECT-based platform for the screening of antibiotics to answer a growing global crisis caused by a lack of new compounds to treat bacterial infections. Dr Anna-Maria Pappa recently won a L'Oreal Women in Science fellowship to continue our work on this topic (see page 20).

The projects mentioned here are highlights of our research program. For more information on these and other activities and our publications see www.ceb.cam.ac.uk/ research/groups/best

We look forward to a fruitful and challengefilled future at CEB and we encourage you to stop by and visit.

Why is Intellectual Property Beneficial?

Dr Jennie Flint, Technology Associate, Cambridge Enterprise



■ The University is full of people working together, solving problems and being creative. In this environment, you may come up with an idea that you have been advised to protect – but what does "protect" really mean? How does protection relate to commercial potential, and ultimately, dissemination for the benefit of society?

The answer lies in the vast sums of money, often millions or tens of millions of pounds, invested in the development, testing, scaling up and marketing required to fully launch a new product based on university research.

Hypothetically, without any protection, when a new product reaches the market, it would be possible for a competitor to reverse engineer it and make their own optimised competing product which they can sell at a lower price as there is no requirement to recoup their millions of pounds in development costs. In this situation, the original developer takes all the risk inherent in developing the new technology and gets little of the revenue. This leaves the original

Cambridge Sensor Innovation at IFA Berlin 2017

Cambridge Sensor Innovation, a CEB spinout company, exhibited at IFA Berlin from 1 to 6 September 2017. IFA is the world's leading trade show for consumer electronics and home appliances. It is the main meeting place for key retailers, buyers and experts from the industry and the media. For the first time, IFA provided a unique and even larger stage for innovation, inviting startups, research laboratories and universities.

Cambridge Sensor Innovation was set up two years ago by Dr Mark Williamson, a lecturer at CEB. The company provides sensors and control systems for heat transfer processes in applications ranging from large scale industrial ovens and dryers



Jamie Davidson, PhD student, next to the prototype built-in oven and sensors at IFA berlin

used to domestic built-in ovens that are controlled and monitored remotely from a smart phone. The technology seeks to improve fuel efficiency, reduce greenhouse gas emissions and to promote consistent and optimal product quality.

www.camsensin.com/ www.b2b.ifa-berlin.com/

CEB INNOVATION

66 A patent is a bargain between a country and an individual. The individual may have a monopoly on the product for 20 years, as long as they place all the information in the public domain. **99**

developer with a dilemma - unless they can stop their competitor reaping the rewards of their effort they can't afford to commit to development of early stage technology. This would be bad news for the University, as everything that comes out of research is early stage technology.

Thankfully, this dilemma isn't really a dilemma at all due to intellectual property (IP). IP solves the problem by providing legal rights to stop competitors capitalising on development effort of others by copying aspects of products or even entire products. IP comes in many different forms, but the form most used in this kind of situation would be a patent. A patent is a bargain between a country and an individual. The individual may have a monopoly on the product for 20 years, as long as they place all the information in the public domain. This way, the person with the IP right can prevent or control the use of the valuable commercial product - they can "protect" their commercial opportunity.

The entity with the IP right can also grant rights to third parties to enable collaboration in developing new technology. This produces mutually beneficial relationships, as it means everyone involved in a project can benefit while preventing competitors from copying their idea. In this way, whole industries can be encouraged to become more innovative.

IP is a powerful tool that can be used for the benefit of society via the route of commercialisation; it can be used for more

66 The answer lies in the vast sums of money, often millions or tens of millions of pounds, invested in the development, testing, scaling up and marketing required to fully launch a new product based on university research.99

Tech Start-up Simprints wins \$2M Innovation Prize



Simprints, a tech start-up company, has won a \$2M innovation prize to prevent maternal and child deaths in very remote regions. The prize has been awarded by Saving Lives at Birth, a 'Grand Challenge for Development', funded

The Simprints Team

by the Gates Foundation, USAID, UKaid and the Canadian, Korean and Norwegian Governments.

Simprints is a non-profit tech company, from the University of Cambridge, that builds open source software and biometric hardware to empower mobile tools used by researchers, NGOs and governments fighting poverty around the world. It was founded by Gates Cambridge Scholars, Daniel Storisteanu, Toby Norman, Alexandra Grigore and Tristam Norman. Alexandra Grigore cofounded the company while studying for her PhD at CEB. She took a one year break to set up the company and is now completing her PhD before joining the company again in a few months.

Even though the World Health Organisation recommends a minimum of four check-ups before birth, only 39% of all mothers are receiving these visits due to challenges in identification and accountability. The Simprints system provides a powerful tool to identify patients in developing countries, instantly finding the right record with the tap of a finger.

It works by these simple steps:

A frontline worker places a beneficiary's finger on a rugged mobile fingerprint scanner

The system runs a matching algorithm

A unique ID links to records which tell the health worker whether the mother has had all the necessary checkups or not and so determines the next steps in care

www.ceb.cam.ac.uk/news/news-list/simprints-sept2017

www.simprints.com/

than stopping others from using a piece of work and encourage innovation. Most importantly, having IP gives the owner control over how it is used, as they have the power to grant rights to people who they do want to use the IP. This is incredibly important here at Cambridge Enterprise, where we encourage active use of IP via commercialisation primarily for the benefit of society.

Top Partner Infinitus China Visits CEB



On 20 September 2017 a large delegation of business partners from Infinitus China visited the Cambridge Infinitus Research Centre (CIRCE). The visitors included Infinitus CEO Lam Yu and the general manager of

Infinitus top management and business partners visit the CIRCE centre in Cambridge (September, 2017)

Product Development Department Jacky Hu. In total there were ca 230 visitors in what turned out to be a very busy and stimulating event which included tours of the biology and laser laboratories at CIRCE and keynote lectures on research developments at CIRCE.

Professor Clemens Kaminski, Chief Scientist at CIRCE and Professor of Chemical Physics at CEB, opened with a historical overview of scientific discovery in Cambridge and then reviewed the vision and purpose of CIRCE as a world leading centre for research on bioactive peptides. He summarized the latest results which show exciting potential of lead compounds, to reduce oxidative stress and protein aggregation in cell models of neurodegeneration and ageing. Dr William Ma, Head of Science at Infinitus and co-chairman of CIRCE, briefed the delegates about the fundamental values on which the collaboration between Infinitus and the University of Cambridge is built how this initiative benefits both partners intellectually and culturally. Mr Jacky Hu, general manager of Infinitus, then presented the overall vision of Infinitus and how co-operation with world leading institutions like Cambridge is vital in its strategy.

Later, the delegation took lunch in the old dining hall of St John's College and were addressed by Professor Richard Prager, Head of the School of Technology, with a toast to the future of the CIRCE collaboration.

Students, PDRAs and technical staff at CEB did a

MedImmune 'PhD Colloquium'

Dr Paul Varley, MedImmune Vice President, Science and Collaborations

■ In November, 65 PhD students attended the first MedImmune 'PhD Colloquium', each sponsored by our Research and Development programmes. Eight were 'Beacon' PhD students, the highest number from any collaborative University department. The day consisted of poster presentations, 'flash' talks, networking and group challenges. An eye-opening, worthwhile and fun event for all!

Our collaborative themes are changing, with an emerging interest in new modalities such as nucleic acid and viral therapies, and associated nanoparticulate delivery and analytical technologies. PhD projects wonderful job in supporting what turned out to be a logistically complex event and CIRCE directors Professors Kaminski and Tunnacliffe expressed their thanks for the extraordinary commitment of the many people who made the meeting the success it was.

MBE Trip to Fieldfisher

Dr Jenny Versnel and Maximilian Ge

The MPhil in Bioscience Enterprise (MBE) Programme is a one-year intensive multidisciplinary



biotechnology and business degree course at the University of Cambridge with a key emphasis on entrepreneurship and commercialisation. Students develop their own business

Maximilian Ge

ideas and receive lectures and interactive workshops from leading academics and key opinion leaders from the pharma and biotech industry. Over 100 expert speakers provide the link to how technologies are being applied at the cutting edge. The MBE benefits from being embedded and strongly interconnected with the UK's leading biotech cluster in Cambridge. The course has successfully run for 16 years preparing graduates for global careers in life sciences and healthcare with a strong alumni base.

MBE students said; "Exceptional content and exceptional contacts. The networking event was a personal highlight and I'm pleased to have made great contacts and friends with the alumni and practitioners of Fieldfisher."

The MBE is incredibly grateful to the many individuals and companies who have supported the Programme over the last 16 years and continue to support and provide guidance to our students not only on the latest science, technology and industry developments but also in terms of their future careers. The MBE Office can be contacted for enquiries at: <u>biosci@ceb.cam.ac.uk</u>

focussed to porous and self-assembling materials have begun and both CEB and MedImmune are part of the TENANT (Therapies Encoded in Nucleic Acid NanoTechnologies)



CEB researcher Miranda Robbins (pictured front row, third from the left), from the Molecular Neuroscience Group at the EPSRC CDT in Sensor Technologies and Applications, was one of the Beacon PhD students at the PhD Colloquium

Technology Touching Life network bid – we hope for a successful outcome!

CEB partner MedImmune and AstraZeneca was recently ranked as a top place for scientists to work by Science and Science Careers 2017 annual Top Employers Survey. See more on www.medimmune.com

Awards

Silvana Cardoso elected to Editorial **Board of Chemical Engineering Journal**

The Chemical Engineering Journal is an international research journal that aims to provide an international forum for the presentation of original fundamental research, interpretative reviews and discussion of new developments in Chemical Engineering. CEJ is the international research journal in Chemical Engineering with the highest impact factor currently (6.2). We congratulate Professor Silvana Cardoso on being elected to the Editorial Board of CEJ.

researchers are selected from those with less than ten years in their independent career, on the basis of the guality and impact of their research. The list includes faculty members from world leading institutions and Dr Zaccone is the only awardee with a UK affiliation.

Source:

www.pubs.acs.org/doi/10.1021/acs.iecr.7b03758

PECIPTA'17 awards for Howard Chase and Su Shiung Lam

ACS Industrial & Engineering Chemistry Research Class of 2017 Influential Researcher Award to Dr Alessio Zaccone



Dr Alessio Zaccone has been listed as one of the 37 most influential early-career researchers worldwide across all areas of Chemical Engineering and Applied Chemistry by the journal Industrial & Engineering Chemistry Research. The journal is published by the

American Chemical Society (ACS) and the

Newton Bhabha Best Poster Award

Sukanya Datta (2nd year PhD student in the Process Integration and Catalytic Applications group) won the 2nd prize for the best poster award in the Newton Bhabha researchers link workshop

that was held in India in December, 2017. This was one of the first conference that happened in the Eastern region of India (Kolkata) to foster research links between UK and India. This conference was very unique as all the speakers in this conference had recently completed their PhDs and were sharing interesting insights about the cutting edge research topics in their



The International Conference and Exposition on Inventions by Institutions of Higher Learning (PECIPTA) is a biannual exhibition organised by the Ministry of Higher Education Malavsia since 2001. PECIPTA, one of the most highly accredited research exhibition in Malaysia, aims to showcase innovative products and services from Institutions of



Datin Paduka Ir Dr Siti Hamisah Tapsir (General Director of Department of Higher Education, Malaysia) and Associate Professor Dr Su Shiung Lam

groups. This conference was funded by many organizations both in India and UK.

was arranged under the aegis of the Newton-Bhabha Fund, The University of Manchester, the



Indian Institute of Science Education and Research (IISER) in Kolkata, India, the British Council and the Royal Society of Chemistry with an aim to bring together young and eminent scientific researchers from the UK and Indian institutes towards building international connections and improving the quality of their research in the process. More information on

www.nmsb.iiserkol.ac.in

The Newton Bhabha Researcher Links Workshop

Noha A. Al-Otaibi nominated for Excelling Student Award



Prince Mohammed bin Nawaf Al Saud and Noha A. Al-Qtaibi

■ Noha A. Al-Otaibi, a PhD student working with Professor Nigel Slater, was awarded the Excelling Student Prize on 9 November 2017 at Saudi Embassy, London. The award is recognition of the valuable research conducted during a PhD and is awarded by the Saudi government bodies represented by the Saudi ambassador HRH Prince Mohammed bin Nawaf Al Saud.

Noha says "My research here in the Chemical Engineering and Biotechnology Department focuses on cryopreservation and cryo-media development. My intensive research deciphered the cryo-damaging mechanisms in different cells modules and identified novel and powerful protective agents that significantly improved cells biopreservation. None of my recognised research would be possible without the support of Professor Nigel Slater, Dr Hassan Rahmoune, our external collaborators and the generous fund from King AbdulAziz City for Science and Technology (KACST) throughout my doctorate studies. So I am deeply grateful to all of them."

Higher Learning (IHL) and enhance networking and collaboration with industry to develop and commercialise the products. This year PECIPTA was hosted on 7–9 October 2017 with the theme of "Nurturing Entrepreneurs through Education, Industry, Technology and Social Innovation".

The inventions by Dr Su Shiung Lam in collaboration with Professor Howard Chase were awarded 2 Gold Medals and one Special Award (Best of 8) from the 460 inventions showcased by universities from Malaysia and other countries. Dr Lam is currently an Associate Professor at the School of Ocean Engineering of Universiti Malaysia Terengganu (UMT).

More information on <u>www.ceb.cam.ac.uk/news/</u> <u>news-list/pecipta17</u>

AIChE 35 under 35 Awards for Rebekah Scheuerle and William Liechty

Two of our alumni, Rebekah Scheuerle and William Liechty, have been recognized as outstanding young professionals by the American Institute of Chemical Engineers (AIChE). They are among 35 young engineers to be given the AIChE 35 Under 35 Award because they have made significant contributions to the Institute and to the Chemical Engineering profession.

Rebekah Scheuerle has just completed her PhD with us in the Bioscience Engineering Group. She serves as a board member of JustMilk, which is developing technology she and others have characterised in the BioScience Engineering Group.

William Liechty was a Gates Scholar in this department and his PhD was concerned with responsive biopolymers. He is now an Associate Research Scientist at Dow Chemical Co.

More information on www.ceb.cam.ac.uk/news/ news-list/aiche-awards-rebekah-scheuerle-williamliechty

Fellowships



L'Oréal-UNESCO for Women in Science Fellowship for Anna-Maria Pappa

Anna-Maria Pappa has won a L'Oréal-UNESCO for Women in Science Fellowship and was presented with the award at a ceremony on 11 October 2017.

This award honours the contributions women make in the scientific field based on the belief that "the world needs science and science

Owens at the L'Oreal awards ceremony in Paris

Anna Maria (left) with Dr Roisin

needs women".

Anna-Maria is currently a Postdoctoral researcher in the Bioelectronic systems technology (BEST) group, headed by Dr Róisín M. Owens and she says, "For me the award not only represents a scientific distinction but also gives me the unique opportunity, as ambassador of science to inspire and motivate young girls to follow the career they desire."

More information on <u>www.ceb.cam.ac.uk/news/</u> <u>news-list/lorealoct2017</u>

Dr Darrin Disley: Barclays UK's Iconic Male Entrepreneur of the Year

CEB alumnus Dr Darrin Disley, CEO of world-leading gene editing company Horizon Discovery, has managed to bag up yet another award, recently being named by Barclays as the UK's male Iconic Entrepreneur of the Year 2017.



Among the nominated entrepreneurs who have successfully turned their

business visions into reality, the judges were looking for icons who have successfully built teams, forming key strategic alliances and overcoming the challenges in scaling their business to deliver significant growth. Of particular interest were those who have demonstrated active support for current and future entrepreneurs who may look to them as role models.

Dr Disley is a serial entrepreneur and great supporter of the Department. He provides valuable guidance and financial support to CEB's MPhil in Bioscience Enterprise students, he is often found sharing his expertise and experiences, inspiring them to aim high.

He is also Enterprise Fellow at CEB, Honorary Fellow at the Judge Business School and an Honorary

Visiting Fellow and advisor on science and industry to the University of Salford. He is currently Director and co-founder of Avvinity Therapeutics Ltd and GeoSpock Ltd, Chairman of Desktop Genetics Ltd, Director of Celixir Ltd and HealX Ltd, Board Member of the UK Bioindustry Association, Chairman of Trustees at Footprint Cafes CIO and serves on

the advisory boards of Axol Bioscience Ltd, Biotech and Money, the Cambridge Science Centre, the Cambridge Phenomenon, Elpis Biomedical Ltd and SimPrints.

He commented; "Very proud to have been named Barclays Iconic UK Male Entrepreneur of 2017 at wonderful event at Landing 42 of the Cheesegrater in London. Thanks to all at Barclays for championing me for this award. Congratulations also to the always awesome Sherry Coutu CBE who was deservedly front and centre as Female/Ultimate Icon. So well deserved!"

More on <u>www.ceb.cam.ac.uk/news/news-list/dd-award-oct2017</u>

Dr Cam Lam: Winner of PNB Group Innovation Challenge 2017



CEB alumnus Dr Can Lam (far right) was one of the 6 Winners of PNB Group Innovation Challenge 2017.

■ Dr Mei Ching Khew (Chief Executive Officer of CCM Polymers) and Assoc. Prof. Dr. Su Shiung (Can) Lam have recently led an industrial research team from CCM Polymers (one of the main subsidiary companies of the Chemical Company of Malaysia Berhad (CCM)) to be one of the winners of the PNB Group Innovation Challenge 2017 - an annual Innovation Competition judged by CEOs of 10 companies within the PNB group. The University@Industry Collaboration between CCM Polymers and Assoc. Prof Lam (Universiti Malaysia Terengganu) under the CEO@FACULTY 2.0 Programme sponsored by the Ministry of Higher Education Malaysia

An award of RM 12,000 was given to each of the 6 Winners selected from the 26 innovations shortlisted for the final round of competition. In addition, the senior management of CCM has promised to further honour this achievement with an internal research grant (a sum of RM100,000 is proposed) to conceptualise and develop the innovative idea leading to commercialisation.

Dr Lam commented; "Developing good rapport is the key to this win, which was a result of good communication, understanding, and team work. This research fund will be used to conceptualise and develop a polymer product that could 'disrupt' the glove industry via a 3-year R&D collaboration between CCM Polymers and Universiti Malaysia Terengganu through matching grants."

More on <u>www.ceb.cam.ac.uk/news/news-list/pnb-su-shiung-lam</u>

Reviews

CEB embraces Diversity



Participants at the first Diversity@CEB launch event.

■ The much-awaited Diversity@CEB launch kicked off on 24 October 2017 with a welcome and introduction by HoD John Dennis, who fully endorsed the initiative and gave his unconditional support.

As part of University of Cambridge Equality and Diversity strategy, The CEB is committed to promote and embrace diversity throughout the Department . In line with this strategy, the Diversity@CEB Team, composed of academic and support staff, agreed on a 'diversity mission 'and organised the launch event in aid of inclusion and a more positive working environment.

Department members congregated in the Atrium for the inaugural event. The launch presentations created much-welcome discussion: Anne Davis, Professor of Mathematical Physics at DAMTP and former University Gender Equality Champion for STEMM subjects, talked about her experience as a female academic in Science, the challenges encountered and the opportunities for promotion in the word of academia. She called for leaders to encourage talented female academics to aim higher and for those in recruitment panels to ensure that there is enough gender balance amongst those shortlisted. Pedro Vallejo Ramirez, 2nd Year PhD student at CEB Laser Analytics group. Born in Colombia but raised in Panama, he experienced a 'culture shock' and confusion when he moved to the USA and found that Americans were rather open to discussing taboo subjects. He also touched on changing University cultures and 'institutional airbrushing', which needed to be properly handled.

Attendees then asked the speakers about their experiences. The Atrium thrived as the audience felt increasingly comfortable to openly discuss the issues raised in the open forum. Finally, challenging preconceived ideas and tackling unacceptable behaviours as a Department was encouraged. It was also acknowledged that, although some positive changes have taken place, there is still a long way to go. The event was then wrapped up with vibrant networking session over drinks and nibbles.

Elena Gonzalez commented on behalf of the Team; "The level of audience engagement was great and it was fantastic to see the lively discussion that followed related to the important issues raised by the speakers. We thank Pedro and Anne for their valuable contribution. We hope others follow suit and we look forward to organising more exciting events in the future so we welcome your suggestions and feedback."

The next event in the series will take place on 13 March 2018 and will be focused on polarised gender and unconscious bias. More information on <u>www.ceb.</u> <u>cam.ac.uk/about/athenaswan/diversity-ceb</u>

CEB Careers Panel Event Returns

■ CEB hosted the annual Careers Panel event with industry hosted on 31 October welcoming experts from relevant industry sectors, who came to the Department to tell CEB undergraduates about their professional journeys and advise them on careerrelated matters.

Undergraduate and some graduate students attended the event for the opportunity to find out more about the varied career options available to them, as well as to help them make informed decisions when faced with questions about specific career paths.

The panel consisted of industry representatives from



Industry representatives taking part in the career panel.

disciplines chosen based on student feedback. Elena Gonzalez organised and ran the event with the help of CUCES (Cambridge University Chemical Engineering Society) Careers Rep, Liam Emmett, as Panel Moderator. Elena noted; "We are very grateful for the continued support our corporate partners and alumni in industry give to our student cohort and the Department. The students found the event a hugely valuable source of advice as it has helped them gain thorough insights into their future career options. CEB would like to thank all panel experts in the panel who represented a variety of industries and companies."

Alumna Myrice Palor, GSK, highlighted that the best part of the job is the variety of the work involved, and the many chances given to solve problems. Gordon Muirhead, GSK Vice-President, noted how rewarding it is "to see graduates transform into confident professionals".

Alumnus David White, Syngenta, embraced the opportunity he has had to work across different functions and projects to be able to see how everything works together, adding; "Don't be afraid to spend time to build on your base, it's an experience not a marathon". Nick from NNL, has thoroughly enjoyed travelling around with work, and encouraged team integration to "become more educated as to how a business works". Andrew Meredith has benefitted hugely from working in a multidisciplinary environment at Schlumberger, anything from measuring the effect of infrared radiation to electro-magnetic measurements.

Liam Emmett. the CUCES Careers Rep noted: "This year, the Department once again hosted an incredibly successful Annual Careers Panel, hosting a large number of industry representatives from a wide range of different sectors. We had a company Director, a Consultant, a Nuclear Scientist and a whole host of Chemical Engineers from many different companies. We also had a strong participation from our consortium partners, such as P&G, ExxonMobil and GSK. Undergraduates and postgraduates alike were given the opportunity to ask specific questions to the representatives about their respective sectors, allowing them to gain a unique insight into the industry. The event could not have been as successful without the hard work of Elena Gonzalez, the CUCES team and the representatives who sacrificed their time to come and speak to us. Thank you all!"

In addition, industry reps from ExxonMobil and GSK noted the availability of good graduate schemes and internship opportunities in technical and management roles within their companies, giving fresh graduates an opportunity to develop important skills across a diverse range of roles.

Upcoming Events

CEB new building official opening, Tuesday 24 April 2018



The new Department Building in

■ The aim of the event is to celebrate the department move to a new, larger building with state-of-theart facilities where talent can grow and produce quality research to tackle global problems. CEB is preparing to welcome alumni and supporters,

West Cambridge. Photo credit BDP Nick Caville. Dick Caville. Industry and academic proparing to welcome alumni and supporters, industry and academic

partners, neighbours and University officials. More information on the programme and advance registration on <u>www.ceb.cam.ac.uk/about/</u> <u>westcambridge/official-opening</u>

Chemical Engineering and Biotechnology Writing Workshops



Anthony Haynes is Director of Frontinus (<u>frontinus.org.uk</u>). Previously he has been Visiting Professor at Beijing Normal University and Hiroshima University. Anthony is a

professional author, editor, and publisher. In the School of Technology in Cambridge he has provided mentoring on writing to over 500 postdocs and graduate students.

The workshops will be delivered by tutor Anthony Haynes in CEB (Lecture Theatre 3),

each run on a Tuesday from 14.00-15.00. In addition, the tutor will remain available for a further half hour, to 15.30, for further discussion, individual queries, etc...

- Scientific Writing, 23 January
- How to Write Productively, 6 February
- How to Write an Abstract, 20 February
- How to Write, Design & Present a Poster, 6 March
- How to Write a Lit Review, 17 April
- How to Edit Your Work, 8 May

After the Q & A session there was a networking session where students were able to engage with representatives of the industries of interest, ask more specific questions and make valuable connections in the process.

Alumni in industry, and corporate partners old and new, interested in contributing to career events in the future please contact Elena Gonzalez on <u>eg314@</u> <u>cam.ac.uk</u>

Sandra Crawford: From Accounts at CEB to Councillor

■ When I'm not at CEB I work as a County Councillor, which can be very rewarding when I manage to achieve something for my residents. Recent cuts to services can make the job frustrating and one case in point was the recent cuts to the Childrens' Centres in Cambridge.

Most parents make use of Children's Centres, especially for a first child as they can receive support from health visitors, doctors and play workers during a time when they might feel anxious or isolated with a new baby. The Children's Centre in Romsey plays a greater role in looking after teenage mums, and sometimes those with post- natal depression or even a health or drugs problem. This Centre has a track record of preventing children from being taken into care. I visited the Romsey Mill and Cherry Hinton Centres and spoke to both the Staff and the parents. The staff stated that the Centre provided early intervention and prevented serious outcomes for the child in terms of needing to be taken into care, so that the human and financial costs of family break up can be prevented.

Parents that I spoke to say that the services they have received helped them with all types of need, a place to meet other parents, ask health professionals questions, and a place for their children to play. A few parents were helped with health issues of their own, and employment and training needs were also met. Councillors like myself were concerned with the cuts and closures to these centres as we know that they play a great role in supporting parents with health and social opportunities for themselves and their children. I took part in the campaign to save the Childrens' Centres in Cambridgeshire from a cut of one million pounds, which would make it necessary to close three quarters of the Centres and make staff redundant.

A petition was handed into the Council with over 4000 thousand signatures, but this made no difference to the outcome. The Co-Director of Cambridge University's Centre for research on Play and Education, Development and Learning, said that the closures were a "false economy." Dr David Whitbread cited evidence that early provision resulted in better educational outcomes later on and better social and health outcomes, and prevented serious problems in later life.

We managed to persuade the Council to retain £100,000 for the Berwick Bridge Childrens' Centre, which serves Fulbourn and Cherry Hinton, but others face closures or moves to less suitable buildings and fewer staff. At least twenty eight will now close. Ata time when children being taken into care is rising, this was a sad outcome, but the Local Government Association will continue to fight for the cuts to be reversed.



Sandra Crawford campaigning (centre) in her spare time!

CEB engages Prospects at Postgrad Open Day



■ Prospective graduates interested in undertaking a course of studies at CEB visited the Department stall at the annual Postgraduate Open Day on 3 November 2017. Nearly 10,000 postgraduate students from more than 250 countries, working in countless different subject areas, contribute to Cambridge's thriving postgraduate community.

Prospective students at the Open Day

Students travelled from far and wide to find out more about the different course options available. The stall in the University Centre Mill Lane, which offered more information on the extensive range of study options at CEB, was managed by CEB course directors, administrators and volunteers. Some stall visitors, final year Chemical Engineering undergrads from UCL commented that they have already applied for the MPhil ACE at CEB. Others were undecided to choose between the MPhil Biotechnology and the MBE (Masters in Bioscience Enterprise). It was a good opportunity for prospects to make valuable contacts and meet CEB staff.

Special thanks to Gabi Kaminski (MPhil Biotechnology Director), Amanda Taylor (Graduate Administrator), Elena Gonzalez (Administrator and Marketing), Max Ge (MBE Administrator) and Zizi Hollander (Sensors CDT Administrator) for getting actively involved. They gave visitors general course info, guidance on the application process and even some interview tips.

More information on

www.ceb.cam.ac.uk/news/news-list/postgrad-openday-2017

CEB Research Video Competition

Congratulations to the winners of the CEB Research Video Competition. The success is a product of a combined team effort with researchers from the Laser, Molecular Neuroscience and Quantitative Imaging Groups having played an active part in putting together this video project: The researchers featured in the winning film are Marcus Fantham, Florian Ströhl, Chris Rowlands, Nathan Curry, Oliver Vanderpoorten, Chetan Poudel, Romain Laine, Katharina Scherer and Clemens Kaminski (PI) from the Laser Analytics Group. Also, Amberley Stephens, Ajay Mishra, and Meng Lu from the Molecular Neuroscience Group led by Gabi Kaminski. The Quantitative Imaging Group headed by Eric Rees was also featured.

The winning team has won a fantastic video production package with Gass Productions, which will give them a chance to have a professional research video of their choice filmed. Elena Gonzalez, organiser of the competition, along with Professor Geoff Moggridge commented; "The combined entry submitted by the very well-deserved winners of this year's CEB Video Research competition is truly remarkable and clearly stands out. These young researchers are not only good at tackling global problems in the lab but have also managed to produce engaging video material without having high-tech equipment available. The quality has gone beyond our expectations; they have stuck to the brief and have focused on a multidisciplinary, collaborative research approach. They were also fantastic at visually communicating complex concepts in a fun and simplified way, as well as selecting relevant visuals to get across the impact of their research and the team spirit that has made it possible!

The winning entry was put on a loop on the TV outside the Laser Lab and shown to the Vice Chancellor, Professor Stephen Toope, when he visited CEB and was taken on a tour of the lab facilities on 15 December. The VIP tour party in fact spent a few minutes talking in front of the short film!

Check the winning video entry and give it a thumbs up on YouTube www.youtu.be/j97qeh0vvuk

More information on

www.ceb.cam.ac.uk/news/news-list/research-videocompetition-winner



STAFF ROOM



CEB Xmas Party 2017

The first Staff Xmas party after the completion of the move to the new building took place on 14 December 2017. The event kicked off with a brief update by the Head of Department (HoD), Professor John Dennis, who commented on CEB's current state of affairs, positioning and future plans. Preparations for the upcoming 'REF2021' (Research Excellence Framework) are top of the agenda. This important assessment ranks the quality and impact of research outputs in UK universities.

He also highlighted the fact that "Everyone has a role to play" in the Department's success. To conclude his brief, he gave colleagues and students his best wishes for the festive season. A short coffee break with mince pies and sausage rolls then followed and research mini talks were given to staff by Dr Róisín M. Owens, Dr Gabi Kaminski Schierle and Professor Geoff Moggridge.

Dr Owens presented on gut health discussing the application of organic electronic materials for monitoring biological systems in vitro, with a specific interest in studying the gut-brain-microbiome axis. Interestingly, this was linked to Dr Kaminski's research work on protein aggregation in Parkinson's disease. Professor Moggridge presented his research work on potential application of block copolymers for prosthetic heart valves. The research mini talks were truly fascinating and very well-received as they were tailored for a general audience and kept both the technical and non-technical audience engaged. After the talks, the department staff and graduate students congregated in the Atrium to have some festive fun with drinks and a delicious Xmas buffet. CEB members mingled around in different social circles, enjoying food and drinks and generally enjoying themselves. The popular Christmas raffle kicked off after lunch with Debbie and her team giving out an incredible of prizes and winners coming up to collect their gifts being clapped and cheered on. A photo booth was also set up for those wanting to be snapped in festive gear. Overall the event has left great memories of CEB Xmas party 2017 in the new building. It was warm, it was friendly, it was "Christmas". Thanks to all department members who organised and/or took part in the celebrations. CEB wishes everyone a Happy New Year 2018!



Assistant and Technical Team having a blast



Roisin Owens giving her research talk

Story with a Moral: "A Corporate Lesson"



SCENE: It's a fine, sunny day in the forest, and a rabbit is sitting outside his burrow, tippytapping on his typewriter. Along comes a fox, out on a walk.

Fox: "What are you working on?"

Rabbit: "My thesis."

Fox: "Hmm. What is it about?"

Rabbit: "Oh, I'm writing about how rabbits eat foxes." (Incredulous pause)

Fox: "That's ridiculous! Any fool knows that rabbits don't eat foxes!"

Rabbit: "Come with me, and I'll show you!"

They both disappear into the rabbit's burrow. After a few minutes, gnawing on a fox bone, the rabbit returns to his typewriter and resumes typing. Soon a wolf comes along and stops to watch the hardworking rabbit.

Comic

Wolf: "What's that you are writing?"

Rabbit: "I'm doing a thesis on how rabbits eat wolves." (loud guffaws)

Wolf: "You don't expect to get such rubbish published, do you?"

Rabbit: "No problem. Do you want to see why?"

The rabbit and the wolf go into the burrow, and again the rabbit returns by himself, after a few minutes, and goes back to typing.

Finally a bear comes along and asks, "What are you doing?"

Rabbit: "I'm doing a thesis on how rabbits eats bears." **Bear:** "Well that's absurd!

Rabbit: "Come into my home and I'll show you"

SCENE: Inside the rabbit's burrow. In one corner, there is a pile of fox bones. In another corner, a pile of wolf bones. On the other side of the room a huge lion is belching and picking his teeth.

MORAL: It doesn't matter what you choose for a thesis subject. -- It doesn't matter what you use for your data. -- What does matter who you have for a thesis advisor. Source: <u>www.shortstories.co.in/corporate-lessons-part</u>





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