

*CEB completes move to new home in West Cambridge**p.3**CEB Teaching Consortium Industry Reps Visit p.18**1st IChemE Davidson Medal**p.19 CEB at the Cambridge Science Festival p.23*

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Message from HoD, Professor John Dennis



The removal of the research activities to the new building at West Cambridge started in March and, by the time of publication of this edition of *CEB Focus*, should be largely completed. This final phase of the move has largely gone according to plan, but the activity has been an exhausting one - akin to each researcher moving house, with the technical teams giving huge support at each move! I would like to congratulate and thank all those concerned for the significant effort required not only to pack up and clean the vacated laboratories at Pembroke Street and Tennis Court Road but also for working swiftly to re-establish research activities in the new building. The latter has, of course, encountered snags, but these have largely been overcome by the team effort involved.

CEB has also been involved in the recruitment of a new University Lecturer to research in the area of Materials and Materials Chemistry. There is a considerable body of existing research in CEB, and one of burgeoning opportunities, on functional materials. It is also a strategic theme identified by the Department in its 2014 Research

Excellence Framework (REF) return. The current emphasis of CEB's research is particularly on advancing the understanding of structures at the micro- and nano- scales to enable the production of well-defined microstructures for use in the development of materials in areas including, e.g. durable heart valves, the highly-specific separation of species from complex mixtures by adsorption, the targeted delivery of drugs, structuring of catalysts etc. The plan is to strengthen and extend our research by having the ability to design new functional materials, with a particular emphasis on understanding their fundamental chemistry and on determining and measuring their behaviour in process use, underpinned by modelling across the various scales of length and time of interest. I am pleased to announce that, after a lengthy interviewing process, we have chosen an outstanding candidate, and the name will be revealed as soon as the official appointments process is complete.

The need to continue to expand our academic and professional support staff in future has emphasised the pressing need for more space in the new building: we shall be developing urgent plans to fund the additional laboratories needed.

Editorial Note



CEB Editorial Team: Chief Editor Elena Gonzalez with Research students Noha Al-Otaibi and Sukanya Datta (bottom) with Aazraa Pankan, Dr Parminder Heer and undergraduate Bahumi Motlhanka

We take this opportunity to welcome new team members Felix Laing and Bahumi Motlhanka and thank former long-standing member Geertje van Rees for her continued valuable contribution and former Undergraduate Publicity Rep Pawat Silawattakun for being the voice of undergraduates during his year in post. We always need more Editors in the Team, so if you are interested in joining and would like to know more about the role, please email us on ceb-focus@ceb.cam.ac.uk. Each member is fully committed to the project and its timely delivery. Individual input and team effort and contribution of enthusiastic ideas is hugely valuable and is crucial to the editing process and helps develop the quality of the editorial content and the publication look. The *Main Article* focuses on the completion of CEB move to its new home. *Undergraduate Focus* shares highlights of the latest student events and a statement from the new CUCES Committee. Graduate Hub features Tamsin Bell's Hair donation to Little Princess Trust, CEB grads triumph at Tiddlywinks tournaments and the launch of CDT Sensors Café. *Teaching Matters* tells about the introduction of a new part IIB subject Bionano-Engineering and more on the use of the donated ABB rig. *Research Highlights* features events

taking place at the Graduate Conference in April. Dr Fruk talks about the educational Molecule Exhibition contribution to the Cambridge Science Festival programme in *Biotech Matters* and in *Research Impact* Professor Alexei Lapkin speaks hot topic "Sustainability and clean chemical synthesis. *CEB Innovation* focuses on the Maxwell Centre Research Showcase with industry and features an interview with Dr Gillian Davies, Cambridge Enterprise Tech Manager, exploring the commercialisation of University research. *Industry Business* tells of CEB start-up, Cambridge ALT, currently disrupting assisted living technology market and the corporate reps' visit to the new building for the annual Teaching Consortium AGM. *CEB Women* features new member of staff Claudia Rehm, Graduate Administrator, covering for Amanda Taylor whilst on maternity leave. It is worth noting a long series of *Achievements*: 1st IChemE Davidson Medal awarded to Dr Silvana Cardoso and Andrew Fellowships for Martin Chan and Jacob Brown. There was also the inaugural BP-ICAM Fellowship going to Dr Radomir Slavchov and Neus Jornet-Martinez handed a Young Researcher Award in Spain. Lisa Hall's group presented their research in Parliament on chemical engineering revolutionising the way diabetics monitor their blood glucose with smartphone apps. Another young researcher, Tamsin Bell, was also selected to present her research in Parliament on the development of catalysts for hydrogen production back in March. Marie Curie Fellow Dr Michael Tayler, sitting among the 400 most qualified young scientists, has been selected to participate in the 67th Lindau Nobel Laureate Meeting in Chemistry in June 2017. *Alumni Corner* features top UK Chemical Engineering alumna Dr Rachel Cooke taking us on an exciting career journey. The *Events* section includes a review of CEB at the Science Festival as well as a list of upcoming events. Finally, *Staff Room* lists Postdoc mentoring opportunities available and *Teatime Teaser* tells of a positive correlation found between wine expenditure and improved student performance.

CEB completes move to new home in West Cambridge

Dr Matthams and Elena Gonzalez

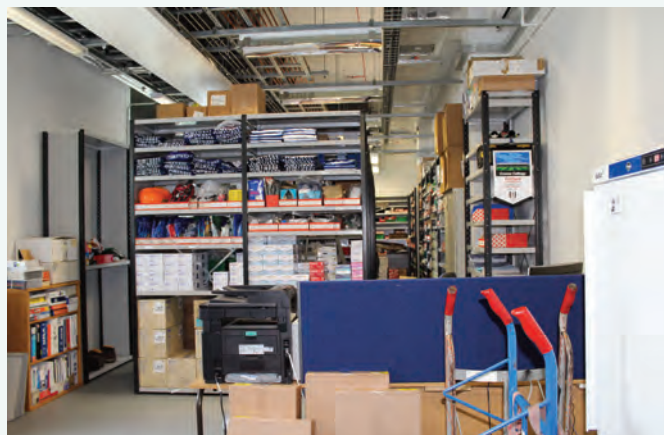
With the move of Undergraduate and Postgraduate Teaching operations to the new building last summer CEB kicked off the new the academic year in style. The remaining research groups were moved during Lent and Easter term 2017 leading to the completion of CEB move into its new home in West Cambridge. The mammoth operation was made a success thanks to the help from a large number of staff and researchers and of course the removals company.



Technician Chris Bawden undergoing the huge task of removing all the unwanted chemicals

The triumph of the move project was mainly down to extremely hard work, co-operation and teamwork, ensuring that all remaining groups were moved away from the old sites into their new spaces in a safe and efficient manner.

Pembroke Street was the first building to be vacated with the Laser Analytics group moving out in mid February. Special crates were built to move the lasers and optical equipment safely to the new building. Reaction Engineering, Catalysis, Combustion, Computational Modelling Group (CoMo), Materials Imaging and Analysis, and Stores followed them to the new building in late March. The Terahertz Applications group completed their move from the Cavendish laboratories at the same time. The Process Integration group moved on 3 April, followed by Lower Unit Ops (Dr Mark Williamson's work, part of Paste, Particle and Polymer Processing group (P⁴G) and Structured Materials), the Centre for Research in Electrochemical Science and Technology (CREST), the Molecular Neuroscience Group and Cambridge Unit for Responsive Biopolymers (CURB).



Department stores in their new location.

Next came the lower and upper Interdisciplinary Materials Processing Laboratory labs (IMPL): The Rheology Centre, Structured Materials Group, Fluids and Environment Group and more of P⁴G, were moved to the new building along with part of the Mechanical Workshop.

There was a short break in the move schedule over the Easter week, although the removals company used this opportunity to crane three items of large and heavy equipment (the X-ray enclosure and two injection moulding machines that would not fit in the goods lift) over the building onto the level 2 terrace and into the new building.

The move recommenced after Easter, with the Cambridge Unit for BioScience Engineering lab (CUBE) and the old Teaching Lab (the BioNano group and the remains of CREST) being cleared at the end of April. The Pembroke St tearoom, IT section, Reception and the remaining staff and student offices were also moved at this time.

The Tennis Court Road laboratory move began in the third week of April: the centrifuges, shaking incubators, static incubators and small autoclave were taken out of use for decontamination prior to the move, electrically disconnected, and securely packaged for transport. The Analytical Biotechnology group, Centre for Neuropsychiatric Research and Molecular Microbiology group were all moved at the beginning of May. Many items of large and fragile equipment including the mass spectrometers from Sabine Bahn's group were moved at this time.

Front Cover Article

The final moves from Pembroke St of the CUBE Tissue Culture Lab, Electronics and the Mechanical Workshop took place on Friday 12 May and, with this building largely cleared, the completion of the move was officially declared.



Crane lifting a lathe into the Mechanical Workshop in the new building

Following the completion of the move, some activities still remain in other buildings (including part of the Magnetic Resonance Research Centre, and the last researchers in the Healthcare Biotechnology group) but the whole Department is now operational under one roof for the first time since the merger of the Department of Chemical Engineering and the Institute of Biotechnology in 2008. It is hoped that this will foster increased collaboration between the researchers and students in all parts of the Department.

The offices and laboratories in Pembroke Street and Tennis Court Road were handed over to the University Estate Management at the end of May. The Tennis Court Road laboratories will be refurbished over the next few years for the MRC Toxicology Unit which is moving to Cambridge. Much of the Pembroke Street buildings will be demolished to make way for the redevelopment of the New Museums site, although the Pembroke Street façade will be retained.

The packing, move and recommissioning of the research labs posed a huge challenge to all concerned. It was an incredibly hectic time for all staff and students but the ultimate goal of moving into a fully operational new building has finally been achieved. There were too many star individuals to name who, despite facing many challenges, helped make the move a much easier and smoother process. Everyone involved should feel they have contributed to the success of the project.

In addition to academic and support staff and all technicians, PhD students and Postdocs took a leading role helping enormously with the move of their own labs, many of them putting their own research experiments on hold and spent endless hours packing their labs away and providing invaluable help to their busy PIs, who certainly could not have done it without them. Students in the Laser Lab, for example, worked tirelessly even overnight, to get all equipment and materials boxed up and moved.

Professor Clemens Kaminski rewarded his team members with generous amounts of pizza. He previously praised their work and the good organisation skills of the removals team led by Lee Peters from Alheavy Removals. A move project of this scale dealing with several sites spread across different locations was certainly testing and involved a whole deal of co-ordination, co-operation, communication and patience. However, it was also a prime example of what true leadership and teamwork can achieve, truly encapsulating CEB values.



Reaction Engineering Group Researchers Dr John Suberu and Sam Aworinde setting up the Reaction Engineering Lab.

Note from the new CUCES President

Krishan Shah, Part IIA CUCES President 2017-18



CUCES Committee 2017. From left to right: Animit Kulkarni, Liam Emmett, Hannah Bryson-Jones, Krishan Shah, Flavia Bush, Felix Laing

I would first and foremost like to thank the outgoing Committee for their outstanding job over the past year. All of the events were well

planned and truly enjoyable. Their effort and dedication has been instrumental to the success of the Cambridge University Chemical Engineering Society (CUCES), and so the new Committee has inherited a fantastic position to start from. The new Committee of Liam Emmett (Careers Director, Part I); Hannah Bryson-Jones (Social Secretary, Part IIA); Felix Laing (IT & Publicity, Part I); Animit Kulkarni (Treasurer, Part I); and Flavia Bush (Secretary, Part I) is proving to be equally dedicated, with lots of enthusiasm and great ideas. It is fantastic that the majority of the Committee is comprised of Part I students and it is great to have people in all parts of the Department getting involved with CUCES. I do hope this trend continues as I'm sure their skills and ideas will prove invaluable.

Over the coming year, we hope to continue the hard work of the previous Committee in increasing exposure to the Teaching Consortium. There will be a continued push for networking and information events, so students gain more knowledge about the varied career options open to them after graduation. In addition, we are hoping to start an annual careers fair allowing students to engage directly with employers. Throughout Michaelmas term, interview preparation workshops will be organised so students are in the best place possible when applying for graduate positions and internship roles. We are also looking to improve the information available to those wishing to pursue an academic career, with presentations from current researchers and PhD students in the Department about their research and experiences.

Another one of our aims is to improve integration

between all years of the Department. We are very fortunate to have such a fantastic new building and are striving to make this a welcoming space for all students, through the social events planned. In addition to the Christmas Dinner, Frank Morton Sports Day and Annual Dinner, we hope to continue the various intra-departmental formal hall swaps and are hoping to organise trips from Cambridge to various breweries.

We are looking forward to taking up our new duties and hopefully we can build on the success of the previous Committee. I hope that in a year's time we can look back at what we have achieved and be proud of our CUCES.

Frank Morton Sports Day 2017

Felix Laing, CUCES IT & Publicity Officer 2017-18



Cambridge "Quidditch" team

On Thursday 16 February, undergraduates were given the day off lectures to make way for one of the biggest events in the Chemical Engineering calendar: the annual Frank Morton Sports Day. This year the competition was hosted by sporting giants Loughborough, whose excellent on-campus sports facilities made for a smooth and well-organised day.

Cambridge fielded a modest team of 47 athletes, who departed at 5.15am on a two-hour coach journey north-westwards to meet more than 2,000 Chemical Engineering students from across the country. After stocking up on free pens, bottle openers and high-sugar snacks from the morning careers fair, the students were taken to their respective sporting venues, and the competition began. The Cambridge teams all fought hard, and although none of them achieved a podium finish, there was no shortage of heart, passion and team spirit. Special mentions go to the "Quidditch" team who, in the absence of actual flying broomsticks, narrowly missed out on a point for

Undergraduate Focus

Cambridge and finished in fourth place, and the football team who, despite losing all of their matches, kept their heads held high throughout, and even managed to score a goal at one point. Overall it was Birmingham who emerged victorious over runners-up Strathclyde, and hosts Loughborough took third place.

The festivities continued into the afternoon and evening, as Chemical Engineers took over pubs and bars across Loughborough to reward themselves for a hard day of exercise. The final destination was the Student Union, where headliners "The Hoosiers" put on a superb show for the crowds.

In the early hours of the following morning, it was time to return to the coach and head back to Cambridge. Overall, the day was a huge success, and credit must go to the Loughborough Frank Morton Committee for organising such an enjoyable event.

CUCES Annual Dinner

Liam Emmett, CUCES Careers Representative 2017-18

The CUCES annual dinner gives students and academics alike the opportunity to celebrate another successful year. This year the annual dinner was sponsored by Shell which has worked closely with CUCES throughout the year. Shell have been a fantastic sponsor throughout the years and without them the event would not have been possible.

This year the venue was the Royal Cambridge Hotel, which provided a delicious menu for the dinner. The food was enjoyed by all, and many also enjoyed the wine option.

The entertainment was provided by the department's very own Dr Patrick Barrie, Dr Carmine D'Agostino and Dr Bart Hallmark. Dr Barrie tried his hand at poetry. His fantastic poem was relevantly course themed and discussed the struggles of a Chemical Engineering student the evening before the deadline for the submission of an exercise. Dr D'Agostino and Dr Hallmark formed a must-see legendary musical double act. Their set list contained many pop and rock classics, such as the Green Day song "American Idiot" and the "White Stripes" "Seven Nation Army" amongst many others. Ultimately, the dinner provided the unique opportunity for students from different year groups to mingle.



Director of Teaching Dr Barrie (centre) with lecturers Dr Hallmark (left) and Dr D'Agostino (right)

On a personal note, I found the event simply amazing and a fantastic opportunity to meet new people. If that doesn't encourage you to come next year perhaps the surreal opportunity to see your lecturers' performance will. I would also like to take the opportunity to thank the outgoing Committee for organising this brilliant evening and for the fantastic work they have done.

Roll on 2018!

Part IIB Research Project Prize Winners

Khoon Kheng Teh & Ray Aun Fan

Imagine you have a plate embedded in a bed of sand – how does the sand move when the plate is lifted, and what force do we require to lift it out of the bed? Our CET IIB research project, entitled "Uplift mechanisms of an object buried under granular material" seeks to answer these questions.

This research is relevant to the field of geotechnical engineering, such as anchoring of offshore platforms and wind turbines. Previous workers have explored the Reverse Hopper Theory developed by Professor John Davidson to predict the uplift force. This year we expanded on this research by developing a new particle tracking algorithm under the guidance of Dr Eric Rees to visualise the bed movement during uplift. Individual ballotini in the bed are tracked throughout the experiment and the resulting trajectories give us information on how the bed moves.

It was a great experience working with Dr Jethro Akroyd, Dr Rees and Professor Davidson as part of the Computational Modelling (COMO) group. They have given us the opportunity to challenge, suggest alternative ideas and are never hesitant to guide us when we face difficulties. Through our weekly supervisions, we learnt about the theory of granular flow, improved on our experimental techniques and developed coding skills. We would like to express our deepest gratitude to our supervisors for their relentless guidance. The research project has been fun and exciting and we thoroughly enjoyed it!

Hair Donation to Little Princess Trust

Tamsin Bell



Tamsin Bell, PhD student at Catalysis & Process Integration Group

Brave PhD student Tamsin Bell cut off her beautiful locks to donate them to Little Princess Trust charity. The Little Princess Trust provides real-hair wigs, free of charge, to boys and girls that have lost their own hair through cancer treatment and other illnesses. Tamsin, who works on on the *Stabilisation of metal nanoparticle catalysts using curved supports*, was delighted that her long hair will be used for one of those wigs. She commented; *"I recently read a news article about the Little Princess Trust, a charity that makes real hair wigs for children that have suffered hair loss due to cancer or other illnesses. All you need to do is send in a plait at least 20 cm long (although 30 cm is preferable) and they make it into a wig. There are a few restrictions on the quality of the hair donated but luckily my hair was suitable so I patiently waited until my hair was a few inches longer in order meet the specification. I think it is really important to spread the word about The Little Princess Trust because this simple gesture of hair donation can improve the well-being of a child in need."*

See www.ceb.cam.ac.uk/news/news-list/donation-to-the-little-princess-trust and read more about the charity on www.littleprincesses.org.uk

If you would like to make a donation visit www.justgiving.com/littleprincesstrust

CEB goes Tiddlywinks

Zach Bond: Combustion Group



PhD participants

Tiddlywinks and CEB have a long association – the first president of the Cambridge University Tiddlywinks Club (CUTwC) was a Chemical Engineer back in 1955 as is the current president. The Department's own Dr Patrick Barrie, Director of Teaching, who is a Tiddlywinks grandmaster himself, sitting at the top of the English Tiddlywinks Association leader board for the last 8 eight years. Incidentally, Dr Barrie was recently crowned Tiddlywinks National Champion!

However, you don't have to be a World Champion to enjoy the game as proved this Lent Term when four novice teams (out of nine) in the tiddlywinks coppers tournament had members of CEB in them, indeed three of the games were played in the tea room at Pembroke street including a fierce clash between the "CEB Combustion" team and "CEB LAG-MNG-QI" team.

The ultimate goal of the sport is to flick plastic disks (using a larger plastic disk known as a "squidger") into a small plastic pot in the centre of a 6ft by 3ft felt mat for three points each. The modern game differs from the traditional children's game by the introduction of the "squop" rule (any wink with another wink on top can no longer be played) and by giving one point to every free (un-squopped) wink at the end of the time limit. This changes the 'winks into an aggressive game of tactics and area control in which the players on each team must work together to immobilise their opponents winks – stopping them from potting. Combining these tactical elements with developing the skills required for manoeuvring the winks reliably (and not just sending them flying off the mat) results in an addictive game where practice really improves performance.



Dr Barrie's caricature featured on the label of a new whisky bottle launched to sponsor the Tiddlywinks Championship.

CUTwC welcomes newcomers to their meetings in Selwyn College each week (generally at 7.30 pm on a Wednesday), and are always happy to provide training and advice – there is also the potential to take part in inter-university cups such as the “Silver Wink” against York and the “Varsity Cup” against Oxford (traditionally rewarded with a quarter blue).

For more information see Zach in Philippa Fawcett Drive tea room at or email him on zb233@cam.ac.uk

Handball Varsity Triumph

Florian Strohl



Florian (holding trophy bottom left) with the winning Team

On 5 March, the mens' handball Varsity match took place at the University Sports Centre, just across the road from the new department. The light blues, led by our own Florian Ströhl from the Laser Analytics Group (LAG), dominated the match from the beginning and - over a comfortable half-time score of 17-10 - beat Oxford in a hands-down victory with 38-26. The Varsity

trophy remains in Cambridge! After a long celebration with LAG spectators, Florian, with a total of 11 goals, was later selected "most valuable player" by the Oxford team. Florian is a 3rd year PhD student in the laser group. He is working on imaging techniques for the study of single molecule protein translation and has published prolifically already on both theoretical and experimental topics of microscopy.

See related news on www.handball.soc.srccf.net/varsity-201617/



Recently launched initiative "Sensors Cafe"

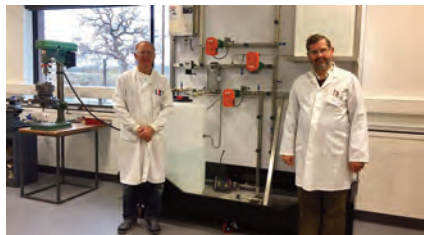
Update on CDT cohort

Dr Oliver Haderer, Sensor CDT Programme Manager
The EPSRC Centre for Doctoral Training in Sensor Technologies and Applications is now in its 3rd year and going from strength to strength. Dr Haderer reported; “The students from our first cohort are now half way through their PhDs. They have set up a company based on the outcomes from their team challenge two years ago, with the aim to provide sensors for the growing market of assisted living for older people. We organised a well-received “dragons' den” event where the students pitched their business to potential investors.

Our current MRes cohort has recently finished its mini projects on a diverse range of topics, including a feasibility study of open-source oceanographic sensors, an investigation into the stability of monoclonal antibodies and modelling superconducting micro-resonator detectors for the next generation of telescopes. The students presented their results in a poster session in the new building which was visited by members across CEB. We have also now started a monthly “Sensors Cafe” to which all Sensor CDT students are invited. So you might see around 30 students enjoying talks and carrying out research related activities in the social area of the new building.”

Donated ABB Rig now in Use

Dr Patrick Barrie, Director of Teaching



The company ABB has built an experimental rig to help demonstrate aspects of process control and kindly donated it to the Department. ABB

is a member of the Department's Teaching Consortium, and is a company with particular expertise in automation and control of process plants.

The rig has sensors for flow, liquid level in tank, and temperature. Valve positions are set by a controller using electrical actuators. The sensors, valves and controller are state-of-the-art equipment as used in industry, while the pipework is laboratory scale. Experiments can be performed on controlling the measured parameters using P, PI or PID control with settings that can be adjusted by the user. The valve settings and process variable measurements are logged continuously.

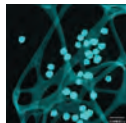
This year, we used the experiment as part of an assessed exercise in Part IIA Chemical Engineering. The apparatus helped reinforce some theory. For instance, it showed that there's an offset with P control, and also that unstable oscillations will be induced if the tuning parameters are too severe. The experiment also showed that real equipment does not always follow ideal theory. As examples, the time for the valve position to change is significant, and experimental noise in measured parameters has an impact. Some real aspects were unexpected – hysteresis in the position of the flow control valve occurred and this became more pronounced as more experiments were performed. We now need to check on the mechanical wear of this component (which had to do a lot of work).

The experiment has helped teaching of other courses indirectly. For instance, it is useful when doing the Part IIA Safety course for students to know that a flow indicator, a flow controller and a flow control valve are different items of equipment that may be located in different places, and can have different reasons for failure.

The experiment will be repeated next year but with some modifications. We are very grateful to ABB for the donation and their support of the equipment.

II B or not II B: BioNanoTechnology

Dr Ljiljana Fruk, Bionanoengineering Group



Bionanotechnology refers to a discipline, which employs nanomaterials/ nanostructures (inorganic, organic) and biological molecules to design new functional materials and devices. In simple terms, bionanotechnology is a bit of everything: there is lots of chemistry (synthesis and modification of nanomaterials), physics (rules of the nanoworld and principles of analytical methods), biology (all those proteins and microorganisms), medicine (drug delivery, diagnostics) and engineering (device and material design). However, it is not just a mix and match course, but it uses the principles of these disciplines to highlight new concepts and methodologies developed since the rise of nanotechnology some 30 years ago, which are now applied for design of new materials, biosensors and nanomedical strategies.

Taking into account that students interested in this course come from wide range of backgrounds, the course provides intro to basic biochemistry as well as nanomaterials (types, preparation and biofunctionalisation) before moving to analytical strategies and finally, various applications. Usually, the latter is something that II B students are totally into, so the final part of the course is a combination of old, established strategies and new, often just published concepts.

Some of the topics covered are: types and preparation of nanomaterials, bio-hybrid material design, nano-inspired catalysts, the role of DNA beyond genetics, basic principles of biosensor design and definition and methods in nanomedicine. In general, one of the ideas behind the course is not only to highlight a field that really truly developed in the last 15 years, but also inspire students to think along the line of interdisciplinarity and be bold in connecting what seems impossible such as DNA and electronic circuits.

There are no textbooks on pure bionanotechnology (we are working on that), so students are encouraged to consult several recommended books from different fields and read the course notes. As a part of assessment there is a student seminar where they have a chance to work together on relevant and up to date scientific papers, and present them to the rest of the class. My motto is: learn playfully and do not learn for exams, but learn for yourself. Hopefully, this is also reflected within the course. Win a molecular chocolate and tell me why Borgs are interesting "bionanotechnologically".

Research Highlights

CEB Graduate Conference 2017

Pierre Bräuer, Third Year PhD Student, Graduate Conference Officer



The Graduate Conference took place for the first time in the new Department of Chemical Engineering and Biotechnology at the West Cambridge site on 24-25 April. The annual conference is organised by the Graduate Researchers' Society and brings together students from groups spanning all the major research areas such as healthcare, processes, materials, metrology and modelling. During the conference, second year PhD students presented their work in two different poster sessions in the afternoon during which lively discussions with academics and peer students from the Department provided valuable feedback on their research. The main body of the conference consisted of third year PhD students presenting their research in 30 minutes oral presentations. The sessions were chaired by an academic or post-doc, who facilitated feedback and evaluation of the talks. Each third year presentation ended with questions and feedback from the audience that hopefully will help the final year PhD students to further their research and to write up their research results.

The Graduate Conference was well attended by students and academics on both days of the conference and provided an attractive opportunity for

all PhD students and academics from the Department to interact with each other, exchange ideas and initiate collaborations between different groups to further the interdisciplinary research in our Department.

I would like to thank all 2nd year and 3rd year PhD students who participated in the conference and put in the work to produce such high-quality poster and oral presentations, respectively. Furthermore, I would like to thank the catering team around Debbie Jacobs for organising the tea and lunch breaks on both days. The coffee and sweet delights in the afternoon, especially helped everybody to stay energised during the following poster session. Finally, I would like to thank Claudia Rehm for helping to organise this event.



Research Highlights



Claudia Rehm shared her thoughts on the event as well; 'Organising events that involve active participation from a large number of students and academics is always challenging. Time is usually scarce and last minute changes in availability are almost certain to complicate things. Nonetheless, as a relatively new person in the Department, the Graduate Conference was a really good opportunity for me to meet and talk to people whom I had previously only known as a name at the end of an email and so I was very keen to get involved. I was really lucky that in Pierre I had a highly motivated co-organiser who stayed remarkably calm no matter what challenges we were faced with (be it the threat of an electricity shutdown on the first day of the conference, changes to our carefully drafted timetables on very short notice and failing projectors, just to name a few!).

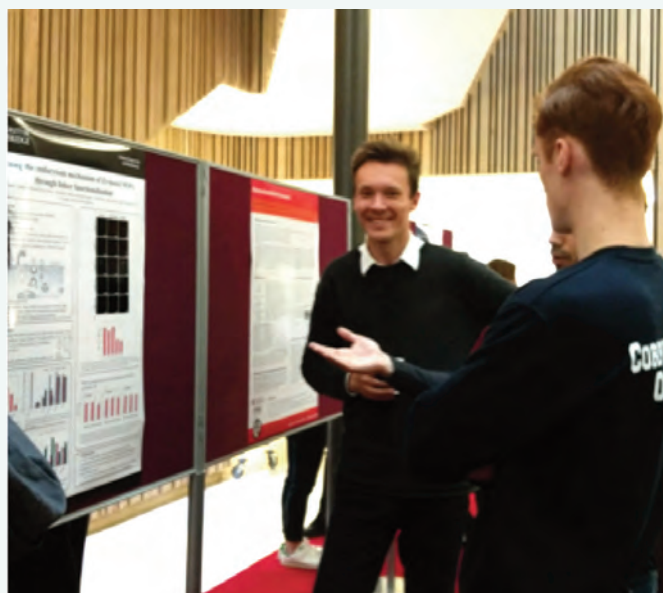
With the truly amazing support of other members of the Department (the academics who kindly offered to chair the talk and poster sessions, Debbie and her entire team and the organisers of last year's conference), we are delighted that all in all the first Graduate Conference in the new building has come and gone without any major hiccups. A big thank you to everyone who helped us along the way and to all the speakers and poster presenters!

Joanna Starkie, a 3rd year PhD student from the Colloids group, who gave a talk was quoted as follows; 'Thank you to Pierre Bräuer and the team for organising the Graduate Conference. It was great to catch up with

the research of other third years and it really showcased the diverse range of work the Department does. The questions and feedback from the audience were really useful in giving me a fresh perspective on my research. It was also really lovely to be able to present in the new building.'

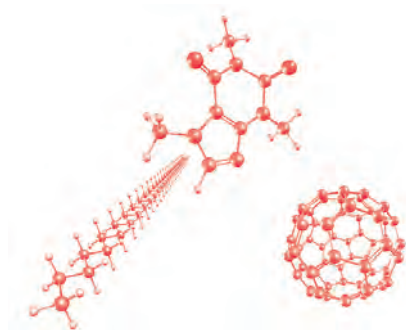
Professor John Dennis, Head of Department, added; 'I thought the talks and organisation were of a very high standard. My sincerest thanks to Claudia and Pierre for the hard work in doing this.'

He will be presenting prizes for best second year poster and the best third year talk on 17 May after the last first year talk of that day.



Molecules that Rocked the World

Dr Ljiljana Fruk, BioNano Engineering Group



All molecules are not created equal, but some are more important than others.

Some have saved billions of lives and made the world a more colourful place, whilst

some others have wrecked the environment and played havoc with human life. Working in this synergy of chemistry, biology and medicine has given life to molecules, such as penicillin, aspirin or progesterone, which had a tremendous impact on our health but also changed the way we live, think and socialise.

There are molecules that have been around for much longer than modern chemistry, molecules such as silicon dioxide, the main component of sand and glass, which has not only changed the architecture, but also communication (optical glass fibres) and the computer industry (precursor of silicon) and is now becoming increasingly important due to the huge negative impact of the sand mining on the environment. Such are also the most common? natural polymer cellulose and hydrating and detoxing urea, which is responsible for 90% of available fertilisers, which forever changed the way and amount of food production. Cellulose is the molecule which is the most common organic compound on earth that forms 33% of all the plant matter and has become one of the world's most widely used materials. It keeps us warm (clothing), transfers knowledge (paper), characterizes reactions (thin layer chromatography) and is now explored to produce biofuel.

In addition, there are man-made molecules: polyethylene, better known as plastics, is a material that changed the 20th century and it now poses a significant environmental problem; the insecticide DDT, which marked the beginning of the environmental movement. Although DDT was found

incredibly efficient against malaria carrying mosquitos, it also caused mass deaths of birds and small animals; or nitroglycerine, the major component of dynamite, which revolutionised mining, industrialisation and transport and brought us Nobel Prizes.

Some of the molecules have simple structure consisting of only few atoms (H_2O , NH_3 , CO_2), whilst others are so complex it took decades to make them in the lab using chemical strategies (B12 or quinine). DNA and fullerene are also among them as their understanding has not only initiated (only within few decades) the development of molecular biology and nanotechnology, but also heroin and stearic acid. The DNA structure was discovered just sixty years back but it led to a scientific breakthrough and has revolutionized the way we see life. Today short DNA strands can be synthesized which can be used in surface structuring and assembly of nanoparticles or proteins which has led to a new research field-“DNA nanostructuring”.

Fullerene is the largest molecule ever found in the universe which is used for drug delivery systems in the body, in lubricants and as catalysts. Research into fullerenes also led to the discovery of nanotubes and graphene which are considered to be the materials of the future.



PhD student Leander Crocker taking challenging questions on DNA structure from a local Cambridge resident

The Exhibition at CEB over the Cambridge Science Festival, the 3D installation “Molecules that Rocked our World”, featured 25 significant molecules (and it is by no means the complete list!). These molecules have changed and continue to change our life, society and history, and the way we perceive the world around us.

See more information on www.ceb.cam.ac.uk/news/news-list/molecules-csf2017

Clean Chemical Synthesis

Professor Alexei Lapkin, Sustainable Reaction Engineering Group

The group is developing clean, sustainable, manufacturing processes for the chemical and chemistry using industries. To the outside world this is about circular economy, energy efficiency of manufacturing, safety of processes, speed of translation of discovery into products and processes, and quantifying sustainability. To the insiders the core of our research is in the fundamentals of reaction engineering: the interplay of chemical reactivity and physical interactions that combine into the complex system that is a manufacturing process, and the ability to predict the likely environmental impacts of the future processes.

Fundamentals of Reaction Mechanisms; new Catalysts and Reactions

Understanding of chemistry is critical for developing predictive models. We work with computational chemists in the Department of Chemistry at Cambridge (Prof. J. Goodman and post-doc Dr Mikhail Kabeshov) and in the School of Chemical and Biomedical Engineering at Nanyang Technological University of Singapore (NTU, Prof. Samir Mushrif) on developing reaction mechanisms through Density Functional Theory (DFT) and experimental kinetic methods. PhD students Jacek Zakrzewski and Yehia Amar, and our former MPhil student Ms Liwei Cao, now at CARES lab in Singapore, are developing mechanistic models for reactions of sp^3 C-H activation, of enantioselective hydrogenation and of aqueous reforming of glycerol. We are then translating mechanistic understanding of reactions into design of novel experimental strategies for process development.

In parallel with the work on mechanisms we work on new reactions and catalysts. PhD student Samson Aworinde and Dr Polina Yaseneva are working on a project with industry, in which they are developing a new reaction scheme and a process to selectively activate alkanes. This is an important topic in relation to large-scale utilisation of low-value abundant alkanes as alternative feedstock to olefins and aromatics for petrochemical synthesis.

As part of catalyst development programme we are working on developing catalyst supports based on layered double hydroxides. This project has started small and now spans several international

collaborations: with George Washington University on the synthesis of materials, with Universitat Rovira i Virgili in Tarragona on developing molecular catalysts anchored onto these supports, and with our collaborators in Singapore.

Translation of Mechanisms into Reaction Models

The effort of producing a mechanistic model pays off when we want to develop a reaction model (see below more on this topic). Jacek Zakrzewski has shown this in his paper, when he was able to predict the behaviour of reactors based on a mechanistic kinetic model (*Angew. Chem. Int. Ed.*, 55 (2016) 8878-8883) and explore the designs *in silico*, which significantly reduces the experimental effort and the overall development time. As a result, we were able to rapidly develop a potential continuous flow process



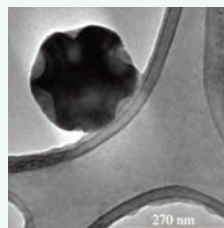
A Si-glass microfluidic reactor frequently used in the group to study reactions under flow conditions.

for a very new chemical reaction, recently discovered in the group of our collaborator in the Department of Chemistry, Professor Matthew Gaunt. Now we aim to generalise

the approach of translating chemical knowledge into good predictive process models.

To be able to observe complex chemical reactions we need good *in situ* measurements. For this reason we collaborate with groups developing new sensors and methods of interpretation of sensor signals. Within a European H2020 project on optimal control of batch reactions (project "RECOBA") we collaborate with the groups of Dr Cate Ducati in the Department of Materials Science and Metallurgy and Dr Andrew Flewitt in the Centre for Advanced Photonics and Electronics in the Department of Engineering at Cambridge. In this team our PhD student Nick Jose, Post-Doc Dr John Suberu and post-doc from Engineering Dr Mario Ramos are developing a microfluidic chip for *in situ* transmission electron microscopy as a tool for direct observation of particle morphology under reaction conditions. Our other technique of interest is *in situ* Raman. Our recent PhD graduate, Dr Claudia Houben has shown that there exists a statistical correlation between polymer

particle size and Raman scattering (*Ind. Eng. Chem. Res.* 54 (2015) 12867-12876). To develop a process sensor on this basis requires a fundamental model. For this we established a collaboration with the group of Dr Alessio Zaccone in this Department.



A TEM image of a polymer particle of complex morphology. Our aim is to establish real time imaging of such particles for economic optimisation of polymerisation processes.



A representation of chemical space through hierarchical stochastic block model for prediction of yet unknown reactions.

Big Data in Process Engineering

Dealing with chemical knowledge presents a particular challenge as there are always multiple possible chemical routes to the same product. This is a particular challenge when we want to replace a conventional feedstock with a bio-feedstock. To deal with this issue we began a long-term collaboration with Elsevier to exploit the entirety of chemical knowledge contained within chemical databases. PhD student Philipp-Maximilian Jacob is

developing methods of assembly of chemical knowledge into networks and algorithmic treatment of this knowledge. In his recent paper (*Green Chem.*, 2017, 19, 140), to which two CEB Part IIB students have also contributed, he discusses the issues around automation of chemical routes screening in terms of their mass, energy and environmental efficiency.

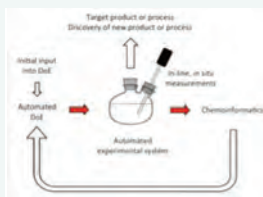
Assembly of Process Models and Speeding up Process Development by Artificial Intelligence (AI)

In order to compare alternative synthesis routes and alternative processes for each of the routes we need to have access to good process models. Developing rigorous validated models for each option would make this task rather challenging and impractically long. Instead, we chose to develop a method of assembly of models from a list of mechanisms that are active in a process, the mechanisms being reactivity, phase interactions, heat and mass transfer, diffusion etc. Dr Parminder Kaur Heer is working on automatic assembly and evaluation of process models. This is one of the approaches we are developing for speeding up process development. A relatively new addition to our tools is artificial intelligence, or more

specifically, machine learning algorithms.

Such algorithms help us to find optimal process conditions, if we treat our process as a 'black box' and automate data collection. This is highly interdisciplinary work in which we assemble skills of process modellers, experimental chemists and chemical engineers and statisticians. In our first collaboration in this field we used a process model developed by our colleagues in Prague Institute of Chemical Technology, with our in house built machine learning algorithm to find new recipes for emulsion polymerisation (*Org. Process Res. Dev.*, 19 (2015) 1049-1053). Later we used the same algorithm to optimise an organic synthetic reaction in a fully automated continuous flow system (*Beilstein J. Org. Chem.*, 13 (2017) 150-163). This was a joint effort of PhD students Yehia Amar and Jazek Zakrzewski, and a visiting Master student from RWTH Aachen Alexander

Echtermeyer. The latest work in the group in this topic is the development of a new machine learning optimisation algorithm by Eric Bradford and Artur Schweidtmann, which we have already installed at our collaborators group in Leeds University and used in several case studies.



The concept of self-optimisation driven by machine learning algorithms.

Sustainability of Processes

Our ultimate objective is to develop clean and sustainable processes. This necessitates in house work on the methods of assessment and we have built up a considerable level of expertise in this field. Our usual questions in this area are: would the proposed change, for example substitution of a feedstock, of a catalyst, replacing batch by a continuous process, and so on, result in a process which would be better, according to all aspects of sustainability. Thus, Dr Polina Yaseneva developed several in depth analyses of the impact of such changes of environmental efficiency of chemical processes, addressing development of nano-structured catalysts (*Chem. Eng. J.*, 248 (2014) 230-241), and translation of pharmaceutical syntheses from batch processes to continuous ones (*Catal. Today*, 239 (2015) 90-96, *React. Chem. Eng.*, 1 (2016) 229-238, *Org. Proc. Res. Des.* 20(2) (2016) 558-567).

Warning: Cutting-edge Research

Dr Agnieszka Iwasiewicz-Wabnig, Maxwell Centre Programme Manager



CEB's PhD Student
Isabelle Bush's 2 minute
talk on MRI

The inaugural Maxwell Centre Annual Research Showcase took place on 17 Mar 2017, and was attended by over 250 participants from various backgrounds (academia, industry, government and investment), based locally and from across the globe. We presented

a very broad spectrum of the cutting-edge collaborative research across Physical Sciences and Technology in Cambridge, for the benefit of colleagues and collaborators, to get inspiration for next endeavours and to identify challenges we can tackle together through research.

The Showcase programme comprised networking at the Maxwell Centre and talks at the Pippard lecture theatre in the Cavendish Lab.

In his opening talk, Professor Sir Richard Friend (Maxwell Centre Director) mentioned the vision and the £63M of co-investments that made the Maxwell Centre possible. Sir Richard discussed "The efficient century", highlighting opportunities with large headroom for technological improvement, considering energy efficiency as the key figure of merit. Societal grand challenges can be addressed through blue skies and innovation in collaborative thinking. For instance, meeting the 2008 Climate Change Act target of reducing the net UK carbon account by 2050 to at least 80% below the 1990 baseline will only be possible through revolutionary technologies, which in turn require new collaborative approaches and investment.

Dr Tony Raven, Chief Executive of Cambridge Enterprise, delivered a keynote talk: *"Enterprise at Cambridge: Expect the Unexpected"*. Tony drew inspiration from centuries of discoveries and ingenuity in science and technology, emphasising those that have had impact on many people's lives: from drug development to great economic impact of the Cambridge area. He reinforced that these developments, building on work by Cambridge researchers and entrepreneurs, are the ultimate embodiment of the University's mission statement: *to contribute to society through the pursuit of education, learning, and research at the highest international levels of excellence*. Tony concluded that a way to approach

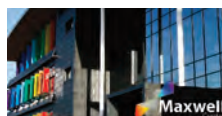
the innovation challenges ahead is *'Making it happen the Maxwell way'*, and cited the Maxwell Centre vision: *Two-way flow of ideas and researchers adds value when 'blue-skies' activities meet research objectives relevant to economic opportunities for industry and society at large.*

The highlight of the day was an hour of very fast-paced research highlights: 30 early career stage researchers presented their work on 1 slide, no more than 2 minutes each. For instance, Isabelle Bush, PhD Student from the Magnetic Resonance group led by Professor Lynn Gladden, told the audience about "MRI: from hospital to the oilfield". Other talks covered topics ranging from mathematical modelling to manufacturing and from medical devices applications to efficient energy solutions. It was a big challenge, but the whistle-stop tour of world-class research across the core Maxwell-linked Departments was very well received.

That's the essence of the Maxwell Centre's magic in action: potential collaborations are discussed, business cards are exchanged, ideas start flowing and great impacts follow.

There is so much collaborative research to showcase, and but a few examples were selected for a deeper glimpse, namely: computational multi-physics (Dr Nikos Nikiforakis, Physics); cellulose photonics (Dr Silvia Vignolini, Chemistry); hierarchical carbon nanotubes (Dr Michael de Volder, Engineering). Dr JT Janssen from the National Physical Laboratory provided examples of industry problems solved through industry-academia collaborations, and possible future challenges to attack together.

Dr Agnieszka Iwasiewicz-Wabnig, Maxwell Centre Programme Manager, summarised the first year at the Centre introducing the philosophy of the Maxwell Programme around 10 keywords – Future, Environment, Breadth, Serendipity, Shared Access, People, Ongoing Inspiration, Research Collaboration, Opportunity and Gateway. Going ahead, the Maxwell Centre is here help you in forging new research links, and to add value to the ongoing academia-industry work.



For more information visit www.maxwell.cam.ac.uk or contact Aga on ai261@cam.ac.uk

Interview with Dr Gillian Davis



Cambridge Enterprise Technology Manager

Gillian joined Cambridge Enterprise (CE) in 2009. She holds a BA in Natural Sciences from Oxford University and a doctorate in laser applications. Having spent ten years as an R&D

engineer, she moved into high-tech business development in 1997, obtaining an MBA with the Open University in 1998. After running a subsidiary of the US company Noise Cancellation Technologies for ten years, she took up the post of Commercial Director at Dolomite Microfluidics in 2007.

CEB Focus Editorial Team caught up with her during an informal chat at her workplace in Hauser Forum, West Cambridge.

You have been at Cambridge Enterprise for a while now. What do you deal with in your day to day role as Technology Manager there? My role is all about helping researchers get their ideas into the hands of companies that will develop them into products that people will buy. Because I work with researchers from across the Physical Sciences and Engineering disciplines, the breadth of technologies I get to learn about is huge. But that's only a small part of my job. I'm also involved in analysing potential markets, helping to develop commercial pitches and—hopefully—getting everyone on the same page and the technology developed.

What's a typical day for you and what are the challenges you face on a daily basis? What is it that really motivates you and what you love about your job the most? I'm not sure there really is a typical day! I have about 20 projects I'm actively working on at one time, each involving a different technology, people and market opportunity. I love the variety of the work. One day could start with meeting a group of researchers in Chemistry to learn about their new idea, then cycling back to my desk to have a call with a company in Germany about the potential market need for a new technology from CEB, followed by joining a researcher team from Engineering as they

take their first step toward getting investment for their new venture by presenting to our Seed Funds Team. Then a quick lunch before spending a couple of hours talking through the first draft of an agreement with a consumer products company interested in licensing a nanomaterial from Physics. It is a challenge juggling so many cases, each at a different stage of development. Bringing everything together and getting the technology into the hands of a company that will try and bring it to market, is tremendously satisfying. But most of all I love being involved with 'cutting edge' research—it's such a privilege.

How 'easy' is it to commercialise science? Tell us a bit on the process itself and how Cambridge Enterprise can help. That's a very interesting question! 'Easy' is a relative term, of course, but I think it's fair to say that commercialisation of early-stage research is complex and demanding. Because of this, 'Technology Transfer' has developed into a distinct profession over the past ten years. The people working in this area need a very special set of skills. They have to be able to understand both the academic mindset and the commercial landscape that a technology may fit into. Cambridge Enterprise bridges the academic and commercial worlds and brings together researchers, people in industry, patent attorneys, commercial lawyers, accountants and investors. This wouldn't work without a skilled co-ordinator who can understand all of the different perspectives. In a nutshell, we are facilitators. We help academics to achieve what they want to achieve with their technology.

In your opinion, what really makes a piece of technology innovation a success? You'd probably expect the answer to this question to be "the technology", but actually it's the people. Of course, the innovation needs to solve a genuine problem for which industry needs a solution, but ultimately it requires people with the drive and enthusiasm to make it happen. That's the key.

Give us an example of a recent successful service you have given to a University Department or a researcher? Short case study perhaps? You might be surprised at how long we need to nurture an opportunity before the market is ready for the ground-breaking research. Five or six years is not uncommon. And then it can take a further five or six years before products reach the market.

A success story, which one of my colleagues worked on, helps to give a bit of an insight into what we do. The technology in this case was an improved thermocouple¹ design that was licensed to TE Wire & Cable LLC² in October 2016. The new thermocouple design improves the reliability of the measurement of extremely high temperatures (over 1000°C), which is very important in applications such as aviation.

The new thermocouple design was developed by Dr Michele Scervini and Professor Cathie Rae. Cambridge Enterprise worked with them for over six years to find a suitable licensee. This involved prototype development, marketing, evaluation deals and eventually license negotiations. It took a long time as the supply chain was lengthy and complex, and it wasn't immediately apparent where the invention would fit in. However, when TE Wire acquired a company that Cambridge Enterprise had been talking to about the technology, serendipity stepped in and a deal was possible. This story has many of the elements that we find are vital to successful commercialisation: perseverance, driven academics, a market opportunity arising and a smidge of serendipity.

What are your views on the state of technology innovation in Cambridge and funding available, and the potential impact? It's a very exciting time for technology and innovation in Cambridge. We've reached a critical mass of academics who've commercialised their research in one form or another. The result is that researchers who're interested in commercialisation are only a connection or two away from someone who can offer advice from their own experience. Researchers are becoming more aware that they can do a lot to help their research have a greater impact on society and that a good way to do that is by working with Cambridge Enterprise.

There's also lots more funding available to help people

move their technology forward than there was in the past, and that's partly due to some of the successes we've had over the last ten years. Cambridge Enterprise itself has reached a critical mass too. We have more technology transfer staff and a huge amount of accumulated experience that gives us a good idea of what best practice looks like.

In your view, what are the most important things to remember prior to launching a new technology? The most important thing is that your invention needs to solve a problem! Once you've shown how your technology is the solution to that problem, think about why industry should care about the problem and your solution, what group of potential customers there are for your technology and what makes your invention stand out among its competitors. Developing a new technology nearly always requires huge effort and expense. A company is only going to take on that challenge if the benefit to them is sufficiently big.

Review the last ten years of operations, what's next on the horizon for CE? We've grown a lot in ten years. Our next phase is consolidating and expanding our services, making ourselves more accessible and ensuring we offer a highly effective customer service from a motivated, experienced team. Everything we do is about helping academics to achieve their aspirations for their technology and, in doing so, making the world a better place.

References

¹ Thermocouple technology on

<https://www.enterprise.cam.ac.uk/?s=thermocouple>

² Announcement by TE Wire & Cable LLC, the company that licensed the new technology on

<http://blog.tewire.com/blog/new-low-drift-announcement-thermocouple-cable-technology-reduces-drift-by-over-80-news-release>



Young Scientists' Start-up for longer Living



Cambridge ALT with Richard Hall, Omar Amjad, Philip Mair (back), Josie Hughes, Oliver Bonner and Isabella Miele (front)

A new startup, set up by six science and technology students studying towards their PhD in the EPSRC Centre for Doctoral Training (CDT) in Sensor Technologies and Applications, is developing an innovative technology platform with the potential to revolutionise at-home care for older people in the UK.

Cambridge Assisted Living Technologies (Cambridge ALT), was set up with the aim of allowing older people to live in their own home for longer. The technology was inspired from a team project that the students conducted as part of their CDT training programme.

On Friday 17 February 2017, the startup met with Daniel Zeichner MP, Member of Parliament for Cambridge, to discuss the potential impact of their new product on the lives of local residents and older people across the country.

With an ever increasing aging population, and the very high cost of care, there is a need to help older people live safe and healthy lives whilst ensuring they can retain their independence. Cambridge ALT have developed a system using the latest in wireless technology and intelligent data processing to learn what normal activity in the home looks like. When an abnormal event is detected, an alert is securely sent to a trusted friend or family member.

As Chair of the All-Party Parliamentary Group on Data Analytics, Daniel Zeichner MP is helping to establish links between businesses, academia and the public to improve policy making in the use of data. Cambridge ALT are in the early stages of their commercial development and are actively seeking seed investment to develop the system further.

Clemens Kaminski, Director of the Sensor CDT, commented; *"This remarkable achievement attests to the high quality of the students that come into the Sensor CDT and their diversity of skills and interests, ranging all the way from socially responsible innovation to entrepreneurship. I am very proud of what these students have achieved and thrilled to see what can result if a few bright minds get together to drive a collective idea. I wish them good luck and fortune in their endeavours!"*

More information will be available on www.cambridge-alt.co.uk

First Teaching Consortium AGM in CEB new home

Elena Gonzalez



Earlier in May CEB hosted the Teaching Consortium (TC) Annual General meeting (AGM), the first to take place in CEB's new home in West Cambridge.

The Teaching Consortium at the Department has been in operation for 17 years and today forms our external industrial Teaching Advisory Board. Consortium members actively support all aspects of process design teaching and professional skills training on the undergraduate MEng course, whilst also providing regular advice on MEng curriculum development from an employer's point of view.

Consortium members also support graduate research by sponsoring projects and travel bursaries on the doctoral training programme as well as the MPhil ACE course.

Professor John Dennis, HoD, welcomed the corporate reps and told them about CEB's ambitions and plans for future expansion (Phase 2 development of the new building). Dr Patrick Barrie, Director of Teaching and Dr Bart Hallmark, both acting as industry liaison for CEB, we are also present.

Dr Andy York (Johnson Matthey Principal Scientist) commented; *'Johnson Matthey has been a member of the Teaching Consortium for around 8 years now. I feel it has certainly enhanced our visibility amongst the chemical engineering community in Cambridge, and it is great to get an annual opportunity to hear news and listen to some of the interesting research going on in the Department. Also, this year it was particularly pleasing to see the Department in their new and impressive building; it is exciting to have been involved in the Department during this time and especially as JM contributed to the funding of the building'*

CEB certainly values the support it obtains from industry helping us educate our students to best meet the demands of industry. Alumna Myrice Palor, Process Engineer at GSK added; *"It is always a pleasure attending the annual teaching consortium meeting. Gordon Muirhead (GSK Vice President) and I value the opportunity to learn about the teaching developments within the department, as well as being able to discuss the gaps in graduate knowledge and/or skill sets that we identify within our industry. This year, we were able to enjoy a tour of the new building with several members of the teaching consortium and other industry representatives. We were particularly thrilled to hear about the positive reception of the recently introduced pharmaceutical engineering module for IIB students, which was created in collaboration with Sander Van den Ban (GSK Technical Director). We look forward to further collaborative successes with the Department in the future and hope to continue to attract applicants from the chemical engineering graduate cohort."*

Medals & Awards

The First Davidson Medal awarded to Dr Cardoso



Dr Silvana Cardoso has been awarded the inaugural Davidson Medal by the Institution of Chemical Engineers (IChemE). The Davidson medal is named in honour of CEB's Emeritus Professor John Davidson and former Head of Chemical Engineering. It is awarded to young chemical engineers, in academia or industry for outstanding mentorship.

Head of Department, Professor John Dennis, said, *"This is a thoroughly-deserved award in recognition of many years of diligent and effective teaching and mentoring in both the Department and in Pembroke College. The award is also very important for the reputation of the Department generally and reminds us of the need for all academic members of staff to pursue the highest standards in teaching."*

Silvana said, *"Professor John Davidson is an inspirational fluid dynamicist in the Department of Chemical Engineering and Biotechnology at Cambridge. It is therefore a great honour that my work with undergraduate and graduate students here has been recognised by the award of the first Davidson medal. I am extremely grateful for all the nominations from my past students for this award."*

The medal was presented at the Annual General Meeting of the IChemE on 10 May, 2017 at the International Convention Centre, Birmingham.

See more information on www.ceb.cam.ac.uk/news/news-list/inaugural-davidson-medal-awarded-to-dr-silvana-cardoso

CEB Research at the House of Commons



Cassi Henderson, Professor Lisa Hall and Andrew Stretton (Photo courtesy of IChemE)

Professor Lisa Hall's group and PhD student, Tamsin Bell, showcased their research in the House of Commons at two different events.

Professor Lisa Hall's project involving the research and development of glucose testing strips for those suffering with diabetes was recently showcased at the House of Commons. Professor Lisa Hall along with her postgraduate students Cassi Henderson and Andrew

Stretton attended the event. The research project was one of ten selected by the Institution of Chemical Engineers (IChemE) to appear at the Chemical Engineering Matters for a Modern World event held recently. Baroness Brown of Cambridge and IChemE's UK Research Committee hosted the event on Thursday 15 December 2016, in the Terrace Pavilion, House of Commons, in London, UK.



Tamsin with Daniel Zeichner, MP for Cambridge

Tamsin Bell from the Process Integration group was shortlisted from hundreds of applicants to attend the Parliament to present her research to a range of politicians and a panel of expert judges, as part of STEM for BRITAIN on Monday 13 March 2017. STEM for BRITAIN

(formerly SET for BRITAIN) is a poster competition in the House of Commons. Her poster on research about the development of catalysts for hydrogen production was judged against dozens of other scientists' research in the only national competition of its kind.

More on www.ceb.cam.ac.uk/news/news-list/tamsin-bell-takes-her-research-to-parliament

Young Researcher Award



Neus Jornet Martínez, has been awarded the Ribera Scientific-technical Award "Algemesi Town" and 1500 € for her work "zein as a biodegradable material for effective alkaline phosphatase substrates in biokits and biosensors".

Neus is a visiting researcher from the University of Valencia, Spain and works on a collaborated project between the MINTOTA group from the University of Valencia and CEB's Cambridge Analytical Biotechnology group headed by Professor Lisa Hall. The research, published in the scientific journal 'Biosensors and Bioelectronics', has direct applications in environmental fields and medicine.

The event is aimed at young researchers born and/or resident in Valencia Community, Spain. Scientific-technical Award "Algemesi Town" is one of the few opportunities that young researchers in Spain have to see their effort recognised.

See more on www.ceb.cam.ac.uk/news/news-list/young-researcher-award-for-neus-jornet-martinez

Achievements

Dr Michael Tayler at 67th Lindau Nobel Laureate Meeting in Chemistry



Dr Michael Tayler from Magnetic Resonance group has been selected amongst the 400 most qualified young scientists to participate in the 67th Lindau Nobel Laureate Meeting in Chemistry by the scientific review

panel of the Council for the Lindau Nobel Laureate Meetings. The meeting to be held from 25 to 30 June 2017 in Lindau, Germany gives young scientists the opportunity to enrich and share the unique atmosphere of the Lindau Nobel Laureate Meetings.

Michael works for the Marie Curie International Fellowship program supported by the European Commission. His research involves use of atomic magnetometers to detect NMR at ultralow magnetic field. He says *"ultralow field (less than 1 microtesla) is attractive because of high magnetic homogeneity. This is advantageous for studying the behavior of fluids near phase boundaries, where conventional NMR methods can suffer from the large internal magnetic gradients in the material"*.

More information on www.lindau-nobel.org/about/

Best Italian Start-up

Alumnus Dr Salvatore Mascia's Continuus award. Pharmaceuticals bagged the best start-up company founded by an Italian entrepreneur.

Italian Ministry of Foreign Affairs 2017 prize for the best start-up company founded by an Italian entrepreneur has been awarded to Dr Salvatore Mascia for his company Continuus Pharmaceuticals. Salvatore gained his PhD at CEB from the Paste, Particle and Polymer Processing group (P⁴G) studying the Rheology and Processing of Pharmaceutical Pastes. After his PhD, he moved to MIT to work with Professor Bernhardt Trout and spun out his company of the MIT/Novartis centre for continual processing for the manufacture of pharmaceuticals.

Christina Karapatakis on Forbes 30 Energy list

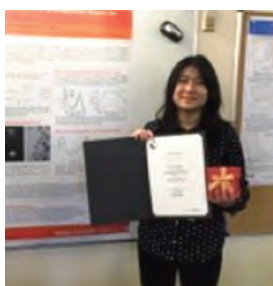


Christina Karapatakis, who graduated from CEB in 2010 with a MEng, has been named as one of this year's Forbes 30 Under 30 in the energy category (January, 2017). Forbes is an American

business magazine, well known for its lists and the energy category considers the most promising young people working on energy issues and one of the best minds reimagining our energy future. Christina currently makes venture capital investments on behalf of Schlumberger, the world's biggest oilfield services company.

Prizes

Evaline Tsai receives Best Poster Award at ECRM2017



Evaline Tsai, a second-year PhD student in the Cambridge Analytical Biotechnology group, received the best poster award at the fourth Analytical Biosciences Early Career Researcher Meeting (ECRM2017) that took place

from 15-16 March 2017 at the University of Warwick. Her poster involved development of pH nanosensors based on upconversion resonance energy transfer. The committee members of the Royal Society of Chemistry Analytical Biosciences Group and the conference attendees selected the best poster that provided the most engaging example of analytical bioscience, whilst conveying the technique's relevance and potential for application in other disciplines.

Best presentation prize for Pierre Bräuer at Johnson Matthey Academic Conference (JMAC)



Pierre Bräuer with (from left to right) Liz Rowsell (Head of the Johnson Matthey Technology Centre), 2nd and 1st year award winners

JMAC is an event for Johnson Matthey sponsored PhD students from all over the world. It took place in Loughborough on the 11 and 12 April 2017. The "Best Final Year Oral Presentation" prize was awarded to Pierre Bräuer from the Catalysis Group at the Magnetic

Resonance Research Centre (MRRC), who is a 3rd year PhD student in our Department supervised by Dr Carmine D'Agostino for his work on developing new methodologies for catalyst characterisation.

Part IIB Research Project Winners



Pey Ling Ng, Olivia Situmorang, Ray Aun Fan and Khoon Kheng Teh

Congratulations to Simon Huang, Hyunil Park, Oliver Iyer, George Graham, Khoon Kheng Teh, Ray Aun Fan, Olivia Situmorang and Pey Ling Ng for the good work on their research projects.

Research projects form a major part of the

coursework for Chemical Engineering students in their fourth year at Cambridge, leading to the MEng degree. The students undertake a piece of original research in pairs or alone. They are required to give a 6 minute presentation and produce a poster in addition to a final report on their work. There were two sessions, on Tuesday 28 February and Tuesday 7 March 2017 and winners were selected in each session.

Fellowships

Inaugural BP-ICAM Research Fellowship Award



Dr Radomir Slavchov has been announced as the inaugural British Petroleum International Centre for Advanced Materials (BP-ICAM) Research Fellow. This centre will lead research aimed at advancing the fundamental

understanding and use of materials across a variety of oil and gas industrial applications. The Fellowship will provide funding for Dr Slavchov to continue his current theoretical research on understanding how deposits build up in components in gasoline and diesel engines such as fuel injectors, which he is currently undertaking as part of a BP-ICAM funded research project. As emission reduction and fuel efficiency targets become more stringent, this research will help inform the development of the next generation of BP's fuels.

This research is also of importance to BP's refining business, where new insights will further their understanding of fouling and deposition issues in refinery operations. Dr Slavchov will also begin new research into the chemistry and thermodynamics of the additives used in BP's fuels and refining operations. The two-year BP-ICAM Research Fellowship commenced in March and will allow Dr Slavchov to work directly with technologists at BP on research for the oil and gas industry.

See more on www.ceb.cam.ac.uk/news/news-list/bp-icam-radomir-slavchov

Andrew Fellowships

Postgraduate students Martin Chan and Jacob Brown have been awarded Andrew Fellowships to enable them to continue their research into the science of the formulation of heterogeneous catalysis. The Andrew Fellowship was set up by the Institution of Chemical Engineers (IChemE) in commemoration of Professor Syd Andrew, a distinguished expert in the field of catalysis.



Martin Chan is a 3rd year PhD student from Combustion group and he says, "I was awarded this fellowship for my work on the formulation of oxygen carriers for chemical looping selective oxidations, supervised by Professor Dennis. *"Part of my work has specifically been on the development of oxygen carriers, where I have shown how the oxygen-carrying capacity of materials may be enhanced without affecting the surface chemistry"*, Martin says.



Jacob Brown is also a 3rd year PhD student, supervised by Professor Lynn Gladden. He says, *"My work is slightly unusual for catalyst science, and I particularly focus on the nature of fluid phases inside porous catalyst materials."*

The work I was awarded for, was showing that we can start to understand these unusual fluid phases by looking at these systems via NMR using high temperature and pressure flow loops. My work is part of a larger project at the Magnetic Resonance Research Centre hoping to understand catalytic processes at operando conditions in detail."

The students will be granted an award of £10,000 a year for up to four years in addition to whatever stipend or salary they might receive in their current or proposed appointment. In addition to this there is up to £5,000 a year available for travel and accommodation expenses in the same period. The fellowship provides funding for up to two candidates every other year and this year, both candidates come from CEB!

See news item on www.ceb.cam.ac.uk/news/news-list/andrew-fellowships-feb17

Changing from Chocolate to Beer to Books and Everything!

Dr Rachel Cooke CEng FIChemE, Head of EU Engineering Program and Capability, Amazon

2017 – Present: Amazon, Head of EU Engineering Program and Capability, Luxembourg
2013 – 2016: SABMiller plc, Global Manufacturing Development Manager, UK
2003 – 2013: Cadbury plc various roles including Product Change Development Manager, Project Manager, Process Engineering Manager and Process Development Manager throughout Europe
2000 – 2003: PhD, Chemical Engineering, Trinity College, Cambridge, UK
1996 – 2000: MEng Chemical Engineering, Trinity College, Cambridge, UK



Although I completed my work experience in the oil and petrochemical industries, I chose the Cadbury manufacturing graduate scheme because I loved the product and had met friendly people during the interview process. I had a series of placements in different

areas of the supply chain: factory management, project engineering, procurement and shift management. After the graduate scheme, I took a role in process development and worked on many new things including chocolate bars, technology and factory capacity modelling. I achieved Chartered Engineer status (CEng) with the Institution of Chemical Engineers (IChemE).

I then moved to Poland to join the team starting up a new chewing gum factory. Planning and co-ordinating the start-up of a brand new factory was a fantastic experience and I stayed on to manage the expansion of production as the process engineering manager. Staying in Poland, my next role was as a project manager moving the production of chocolate bars from the UK to Poland. Whilst I was in Poland, Kraft Foods acquired Cadbury and I moved back to the UK into a role in the new company as a Product Change Development Manager. In this role, I was responsible for managing all the changes to the gum and candy products from project initiation through to implementation and launch. I also became a Fellow of IChemE.

At the end of 2012, the brewer SABMiller offered me a global role. I was responsible for monitoring and analysing the effective implementation of SABMiller's global operational excellence programme; managing the transfer of knowledge and manufacturing best practice, as well as developing strategic value chain capabilities. I had to travel to Africa, Australia, Latin America, the USA and Europe. In September 2015, the world's largest brewer, Anheuser-Busch InBev, made a formal approach to acquire SABMiller. I had several options open to me and was delighted to choose a role with Amazon in Luxembourg. It's still early days, but I'm responsible for the program of growth in fulfilment centers throughout Europe and building the capabilities of the engineering team. Each time I have moved company, I have always looked to work with bright, friendly people in a company whose products and services I enjoy.

I have also been active in the voluntary sector throughout my career. Whilst studying for my PhD and at Cadbury, I worked to raise the profile of chemical engineering and STEM (Science, Technology, Engineering and Mathematics). For this I was honoured by several bodies, including receiving the IChemE's Global Young Engineer of the Year Award in 2007. On my return from Poland, I chaired IChemE's Food and Drink Special Interest Group for nearly six years and spent two years as a member of IChemE's UK Board. In 2014 I was named as one of the top 100 most influential individuals in UK manufacturing by the Manufacturer Magazine and in 2015 I was awarded IChemE's global ambassador prize. I am fortunate to be able to continue my voluntary work as a director of the Cheltenham Science Group, a community interest company working to inspire a new generation and establish a permanent science centre in Cheltenham.

Reviews

CEB at the Science Festival

Elena Gonzalez



Elena Gonzalez and Dr Ljiljana Fruk designed a fun science colouring book

CEB participated in this year's Science Festival again, taking the opportunity to launch its very first CEB Science Colouring Book at the annual highlight festival on 13 March.

The CEB Science Colouring book has

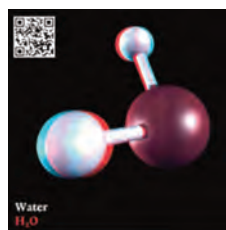
been created as a communication tool, part of a public outreach strategy, to help engage the general public with science and the research work being undertaken at the Department. The colouring book is being given out at public outreach events.

Dr Ljiljana Fruk and Elena Gonzalez teamed up to put together a colouring book using science images supplied by talented researchers. Dr Fruk, an academic champion from the School of Technology on the Public Engagement Advisory Group, heads the public outreach function at CEB and Elena helped with the marketing side of things. CEB ran a photo competition calling researchers to submit suitable artistic scientific images depicting their work to be included in the book. Catchy and easy to understand captions were also used to describe the image and the crucial role particles and molecules play in developing key innovative solutions in sustainability and healthcare. These images are the basis of the book's content, inspired by a mix of art and science.

Ljiljana and Elena worked on the design of the fun "Colour in-Knowledge out" book project, along with professional designer Charlotte Sankey from Creative Warehouse. Ljiljana commented; *'We just wanted to put some fun into presenting research, removing too much text, but getting to the point with a bit of humour and lots of colour.'* Elena added; *"Our aim was to create an educational tool that helps explain complex science concepts and chemical reactions. We thought that a fun activity of an artistic nature like colouring, whilst helping communicate amazing facts about science and our research work, could engage kids and adults, bringing science closer to the general public. The captions accompanying the drawings were also adapted, using simplified and less technical language, to make it more*

appealing to the public and help them understand these concepts, driving them to want to discover more"

The didactic book, which uses art as a form of inspiration to engage the general public and getting aspiring scientists interested in what CEB does, shares important facts about the science underpinning departmental research projects were shared, whilst demonstrating the positive impact and benefits of its key research activities on society as a whole. The Colouring Book is available to download from www.issuu.com/cebcambridge/docs/colouring_book_artwork_for_online



The Colouring Book launch also coincided with the start of the "Molecules that Rocked the World", a 3D interactive exhibition on site, led by Dr Fruk, along with her BioNano Engineering Research Group.

The relaxing exhibit was on display from 13- 24 March at Pembroke Street site's former Library. This event was the very last to take place at the Pembroke Street site as CEB recently completed Phase 2 of the move to its new home in West Cambridge.

The Molecule Exhibit paid tribute to 25 of the microscopic structures, which have changed the world. It was a hugely popular activity and attracted a huge number of visitors and school kids wanting to know more about them. Laura Brainwood, of Cambridge TV, visited CEB for a taste of the interactive experience and interviewed the team at hand, reporting about the molecules in a brief documentary on www.youtube.com/watch?v=JuaBF3LVSqM (©Cambridge TV).

The exhibit was CEB's own contribution to the Science Festival, as well as the Science Booth, which departmental researchers and volunteers ran at the Plant Sciences Marquee on Saturday 18 March.

A team of volunteering researchers lead by Public Outreach at CEB showcased the amazing science they are involved in at their booth in Plant Sciences. There were demonstrations and experiments carried out showing important chemical reactions. It was done in a very 'colourful' manner. Researcher Leander Crocker,



from the BioNano Engineering group, put together the Elephant's toothpaste – a demonstration of the catalytic decomposition of hydrogen peroxide by utilising some household ingredients - liquid soap and baker's yeast. Catalase (an enzyme also found in our liver) is found in baker's yeast and acts as the catalyst in the reaction, rapidly breaking down hydrogen peroxide into oxygen and water. The enthusiastic researcher commented; *'As a small amount of hydrogen peroxide generates a large volume of oxygen, the oxygen quickly pushes out of the flask or beaker in which the reaction is carried out in. The soapy water traps the oxygen, creating bubbles and turns into foam. We can also use food colouring to add that 'toothpaste' look!*

Volunteers loved engaging with curious kids and adults alike, who approached the stall throughout the day, dressing up as scientists for the day and mixing up chemicals to experience the results of chemical reactions first hand. Researcher Amberley Stephens from the Molecular Neuroscience group presented a poster and noted; *'I had a great time! Knackering but really fun. The best part of the day was listening to two young girls walking away from our stand saying 'that was totally amazing'. Inspiring the scientists of the future!'*



Upcoming

CEB Research Conference: 26-27 June 2017

Dr Christopher Ness, Visiting Academic in Statistical Physics Group



Last year's CEB Research Conference

The CEB Research Day will take place on June 26-27 2017 at the Department of Chemical Engineering and

Biotechnology, Philippa Fawcett Drive, West Cambridge. This conference is designed to showcase the Department's research and to provide a networking/collaboration event for members of the Department.

The event will bring together the Department's research groups through a series of invited and contributed talks and poster presentations covering the broad research activities of the Department.

The conference will begin at noon on June 26, before an afternoon of scientific discussion followed by a drinks reception and conference dinner. On June 27, the conference will resume at 9am and will culminate with an Invited Talk by Professor Clare Grey FRS. Expanding the event over two days creates more time for scientific discussion, setting up new collaborations and identifying new exciting challenges. The Department cordially invites its academic cohort, postdoctoral researchers, PhD students and assistant staff to take part for what is sure to be an interesting event. Attendees are strongly encouraged to discuss ideas with participants in order to identify new and emerging challenges that will define the future of specific research fields.

Chris Ness, Maudslay-Butler Research Fellow and Visiting Academic, commented on behalf of the Organising Committee; *'This exciting event will showcase the Department's research and provide a networking and collaboration opportunity for all members of the Department and current and potential industry partners. We will bring together our diverse research groups through a series of contributed talks and poster presentations!'*

See more information on the programme on www.ceb.cam.ac.uk/research/ceb-research-day-17/programme

From Student to Student Administrator

Claudia Rehm, Graduate Administrator



Originally from Austria, I have lived in the UK for almost seven years now. I started out in London, where I studied for a Bachelor's Degree in Linguistics and Japanese. I have had a passion for languages for as

long as I can remember and in addition to Japanese, I have in the past already attempted to learn Spanish, French and Russian (and my English is alright too, or at least so I am being told). As London is not the most affordable place to live, I also had a full-time job at Lovefilm while I was studying. It was back then the leading instant movie streaming service in the UK (now known as Amazon Instant Video). I was in charge of quality control for all the movies which were due to go out on service, which means that effectively, I got paid for watching movies for two years!!

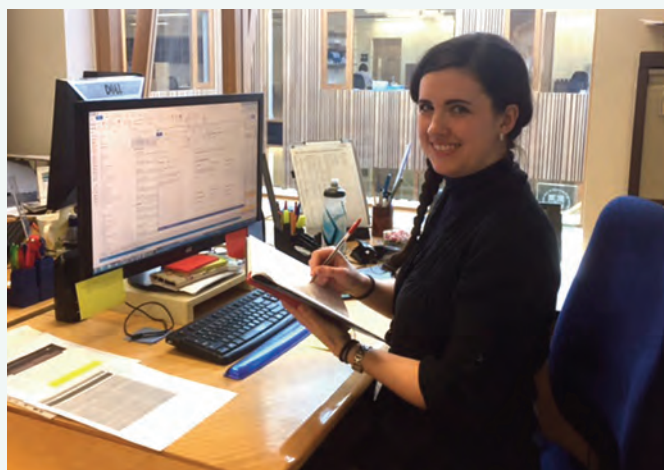
In 2012, I moved to Cambridge with my boyfriend, who got offered to do a PhD here. I embraced this opportunity to further continue my education and completed a Masters in Theoretical and Applied Linguistics at the University of Cambridge in July 2015. After that, I started working as a Graduate Administrator at the Laboratory of Molecular Biology just next to Addenbrooke's and joined CEB in February 2017 as a maternity cover for Amanda Taylor. Having been a student at the University myself, I have found it very useful for the job, as I understand the admissions process and challenges students face. What I enjoy most about this role is that I get to know so many talented people from all over the world, who are all from very different walks of life and have different stories to tell.

Although I have only been at CEB for a few weeks, everyone has been really supportive in helping me to settle in and I feel really welcome in the Department. Having come to CEB from a Biological Laboratory with

a majority of male scientists, I have been very impressed with how many female scientists walk the corridors of this Department. In my eyes, getting girls interested in science starts very early on in childhood, by exposing them to the same toys and experiences boys usually get exposed too. Having two brothers, I have seen how they have grown up playing with Lego Technic and toy tool sets, while I usually got dolls and books as birthday and Christmas gifts. This is not to complain about getting books (I am a self-confessed bookworm) but both my brothers are Engineers now while I have gone on to study languages and I think that all three of us might have been biased towards certain decisions we have taken later on in life very early through our childhood experiences. Having female role models and outreach work will in the future hopefully encourage many more girls to become scientists.

In my spare time, I love to read and I am a secret history geek (especially anything that involves the Tudors, Plantagenets and Stuarts), so I feel that I have definitely chosen to live in the right country. I also love to travel and having grown up in a rather rural place, I tend to be more drawn to busy cities rather than the relaxing beaches of the world.

My motto in life is that if life hands you lemons, get water and sugar and make lemonade. The glass is always half full, never half empty.



Cambridge Minds

*Thomas Meany, Interdisciplinary Research Fellow,
Department of Plant Science*



Cambridge Minds is an initiative, created by the Entrepreneurial Postdocs of

Cambridge (EPOC), which seeks to connect researchers and industry. Cambridge Minds helps support the development of postdoc skills in consulting which provides them with additional income, improved network and alternative career opportunities. University researchers, while fascinated by industry, find it hard to face up to the challenges of building a business from scratch out of their research activities. Yet quite often their work can prove extremely valuable to commercial groups as well as policy makers.

As an example of how a researcher might begin engagement is the first port of call for researchers is our website (cambridgeminds.org). They can build their profile on our web platform and highlight their skills and career milestones. From here they can choose to be contacted by one of our industry partners for a paid "expert call". These calls come from industry members seeking advice or guidance on a targeted subject area. In the case where this might be suitable for a longer term project we can help coordinate interactions which may last from 1-5 days for short term activities such as providing a lecture or training a staff member. Long term projects (in excess of 1 week) can also be arranged. These are extremely varied but generally consist of a researcher "de-risking" a project for a company considering moving into a new area. In the past these have resulted in job offers.

In the future we will be hosting workshops and encouraging researchers to attend and learn more about the alternative career streams available to them. If you have any questions or are interested in getting involved please visit www.cambridgeminds.org

Postdoc Opportunities in Colleges

Dr Kristen Klebba, College Affiliations Officer, Office of Postdoctoral Affairs (OPdA)



In 2015-16, the Office of Postdoctoral Affairs (OPdA) launched an initiative to support college affiliation opportunities for postdoctoral researchers. Research indicated that while postdoc affiliation

programs had grown in number over the two previous academic years, these programs themselves could be further enriched through postdoc-facing activities so as to fully integrate postdocs into the fabric of Collegiate Cambridge. The notion of a postdoc 'Convenor' was born; that is, a postdoc within each College appointed to induct new postdocs, organize activities and events and to provide an anchor-point to the community. Twenty-two Colleges and their Convenors now form the basis of the Colleges' Postdoc Network which meets twice per academic year to discuss ideas and good practice around College life for postdocs.

In parallel, the OPdA has worked closely with Clare Hall to develop their postdoc affiliation scheme. With its egalitarian ethos, family-friendly policies and open approach to postdoctoral membership (they hope to affiliate 200 postdocs per year), Clare Hall was keen to think about new and exciting ways to engage their community. The College now has a busy roster of postdoc-facing activities including networking sessions with Fellows and alumni, regular postdoc formal halls, semi-annual career workshops, a weekly postdoc writing group and an annual 'study break' hosted by the postdocs for students during exam term. More on Clare Hall's postdoc scheme can be found via www.clarehall.cam.ac.uk/postdoctoral-members

For more information and details of current College affiliation opportunities see www.opda.cam.ac.uk/whileincambridge/collegeaffiliation

Brief History of Alcohol: Impact of Wine Expenditure on Student Performance

Pawat Silawattakun, Part IIA

It is believed that alcohol manufacturing began as early back as 10,000 years ago, after early farmers observed that fermentation in fallen fruit had a fizzy and sharp aroma. Trial and error resulted in the first known alcoholic drinks being produced from a combination of honey and wild yeasts. 4,000 years later, evidence has shown that grapevines were being cultivated around the Black and Caspian Seas for wine-making. The wine industry grew in the West with trading between the empires – the Romans even had a God dedicated to wine (Dionysus). In the East, China may have independently discovered alcohol as well, whilst India began production of beer using barley and rice around 800 BC.

In contrast, the chemical engineering profession was born slightly more recently, with the discipline being developed out of 'industrial chemistry' in the advent of the Industrial Revolution in the late 19th century. Unfortunately, chemical engineering as a profession is generally defined as the switch from chemical production using a batch process to a continuous process. As the majority of alcoholic beverages are still produced in batch processes to ensure the best taste (by having a range of microbe ages in the reactor), we cannot quite legitimately claim to be an ancient profession, although distilleries still play a key role in manufacturing stronger spirits such as vodka.

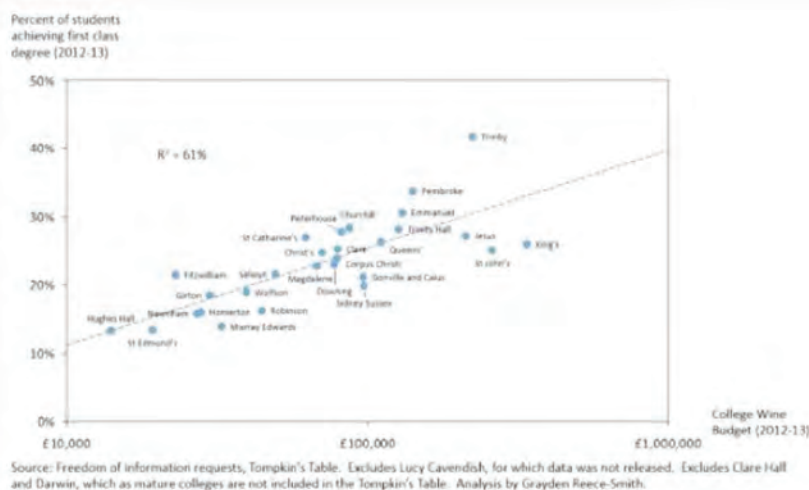
Throughout the years since alcohol has been discovered, there have been endless debates on whether alcohol should be drunk in moderation or

even drunk at all. Drunkenness has often been associated with sin in different cultures; protestant leaders in Europe believed alcohol could be drunk in small quantities for pleasure, enjoyment, and health. The prohibition in America was implemented to ban alcohol entirely during the First World War; however, this only gave rise to organised crime that trafficked in illegal alcohol. On the other end of the spectrum, in early 18th century UK, harsh taxes on gin had to be placed in London to control the 'epidemic of drunkenness' that followed the mass production and oversupply of cheap gin.

You may be wondering what this is all leading up to. There seems to be a trend where too little or too much alcohol will create issues for the society, so a balance must be reached (we expect some performance curve to show a maximum against alcohol supply). This balance is clearly not reflected one bit in Cambridge; statistical data shows a positive correlation (and hence causation) for how much each of the Cambridge colleges spend on wine against student exam performance. The figure below shows that investing in wine can make a significant difference to students' examination results. Perhaps someone could put forward a motion for the CEB to occasionally hand out free wine in conjunction with free tea as well!!? (or maybe vodka, as it is more relevant to the Chemical Engineering discipline).

¹Please note that correlation does not always lead to causation.

www.narconon.org/drug-information/alcohol-history.html
www.en.wikipedia.org/wiki/History_of_alcoholic_drinks



CEB Teaching Consortium of Companies



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visit www.ceb.cam.ac.uk/undergraduates/teaching-consortium

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