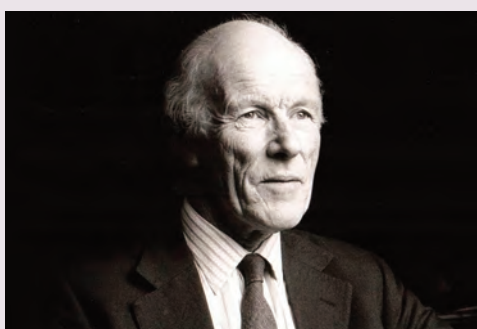
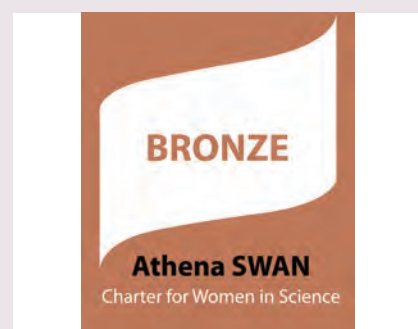




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CEB new Building Move Phase 1 begins

p.3New Sensor Technology for assisted Living *p.16*New IChemE medal launched in honour *p.19*
of Professor DavidsonCEB scoops Athena SWAN Bronze *p.26*

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Welcome

Message from HoD, Professor John Dennis



I am pleased to report that the Department occupied the office and teaching block in the new building during September. As a result, all undergraduate and postgraduate teaching is now taking place in our new facilities. It is anticipated that

the contractors will have finished the research laboratories by the end of 2016 and so research groups will move from Tennis Court Road and Pembroke Street during Spring, 2017.

Reactions to the new building have been uniformly positive. A particularly important feature as we strive to establish a firmer team culture throughout CEB is that there is much greater visibility of the occupants in the

building, so that informal interaction is much more frequent than in the old buildings, particularly in Pembroke Street. The social spaces on the lower ground floor are outstanding, as are other breakout areas.

As Head of Department, I would like to express my profound thanks to all those members of professional support and academic staff who have worked very hard to ensure that we can teach effectively this Term. The fact that the Department is temporarily on four separated sites places a great strain on operations, and many are doing sterling work in coping with this problem.

We look forward to many happy and successful years in our new premises!

Editorial Note



CEB Editorial Team - From left to right: Pawat Silawattakun, Aazraa Pankan, Chief Editor Elena Gonzalez, Geertje van Rees and Dr Parminder Heer

CEB Focus¹ Editorial Team wishes all staff, students, alumni and partners old and new a fantastic start of academic year. Also, a very warm welcome to all new Tripos undergraduates, Masters' students from Advanced Chemical Engineering (ACE), MPhil in Bioscience Enterprise (MBE) and Sensors Technologies and Applications Centre for Doctoral Training (CDT), who will be educated exclusively in our new home in West Cambridge. CEB has just won the Bronze Athena SWAN award for its commitment to addressing gender inequalities, tackling the unequal representation of women in science and improving career progression for female academics.

Last summer was indeed hectic for all CEB staff as the Department embarked on preparations for Phase 1 of the move to the new building. *The Main Article* in the Michaelmas edition focuses on the move of teaching operations to the new building in West Cambridge.

CEB Women, features insights from researcher Amberley Stephens on career and science. *Industry Business* reports on the latest networking events and exciting industry collaborations such as Infinitus-CEB's, following last's year launch of CIRCE (Cambridge Infinitus Research Centre).

Undergraduate Focus features student event highlights and reports on summer internship experiences. *Research*

Highlights tells about Dr Axel Zeitler and pharmaceutical engineering and Professor Wilson, recently appointed FBP magazine Editor in Chief, and his research on soft solids and removing baked-on food. *The Research Feature* is an account of Dr Silvana Cardoso's research in fluid dynamics published in high impact journals. *CEB Innovation* presents key innovative solutions such as the assisted life technology to improve life quality, recently developed by Sensors CDT Masters' students. PhD student Theresa Maier stands out in *Graduate Hub* with repeated success having been selected for both Roche continents Programme and Merk Innovation Cup global competitions, and winning the latter with her team's novel approach to controlling schistosomiasis transmission.

Achievements section showcases CEB's academic excellence and stories of success from young researchers and academics: from the new IChemE Davidson Medal launched, Geoff Moggridge's promotion to Professor, the Danckwerts Pergamon Best Thesis award going to Chris Boyce, the Leete Award going to Chris Valentine with his Sensors CDT research project and PhD students Yehia Amar and Florian Ströhl winning poster prizes. Finally, *Alumni Corner* features former Faculty Professor Jim Wilkes and his memories of the first Chemical Engineering Secretary, Margaret Sansom.

¹ CEB Focus Newsletter is the product of a joint team effort led by Chief Editor Elena Gonzalez. The Editorial Team of volunteers is fully committed to the project and its timely delivery, contributing their enthusiastic ideas to help enhance the editorial content and look of the publication. Thanks to CEB webmaster Vanessa Blake for regularly providing photos and to all article contributors. Please do contact us on ceb-focus@ceb.cam.ac.uk if you are interested in joining the Editorial Team or have suggestions for content. Current and previous newsletter issues can be downloaded from www.ceb.cam.ac.uk/news/ceb-focus or viewed from any mobile device on www.issue.com/cebcambridge

CEB new Building Move Phase 1 begins

Elena Gonzalez



HoD Professor Dennis welcomes Undergraduates CET1 in one of the state-of-the-art lecture theatres in the new building

Following some delays in the completion of the new building, CEB is delighted to report that the Department has now moved all its undergraduate and postgraduate teaching to its new premises in West Cambridge for the start of the new academic year. It is expected that research will relocate to the new building from the beginning of 2017.

The start of the summer saw a final redecoration and the arrival of furniture with CEB feeling increasingly confident that the social space and teaching facilities were ready and up to the standard required for occupation. Accordingly, the experimental apparatus for the Part I teaching laboratory was moved during the second week of August, with subsequent reassembly and commissioning of the equipment during September. New Magnetic Resonance Imaging (MRI) equipment was delivered in August and is currently being commissioned. The Davidson Library in Pembroke Street was packed and moved to West Cambridge. The IT team finalised the network set-up and made computers, telephones and printers along with wi-fi access available around the building. Mid-September witnessed the move of the remaining elements required to begin undergraduate and masters teaching in the new building, i.e. a new IT suite and catering and cleaning services.

The new building is part of the University's science and engineering hub on the West Cambridge site and

is perfectly placed to maximise links with a number of other Departments, including Physics, Computer Science, Materials Science and Metallurgy, the Institute for Manufacturing and CAPE. The Maxwell Centre, Cambridge Enterprise and the Hauser Forum are very close neighbours, too.

Head of Department, Professor John Dennis, commented; *"I would like to thank everyone involved in this first phase for working so hard and diligently to get everything ready. I am pleased to report that the Department occupied the office and teaching block in the new building during September. As a result, all undergraduate and postgraduate teaching is now taking place in our new facilities. It is anticipated that the contractors will have finished the research laboratories by the end of 2016 and so research groups will move from Tennis Court Road and Pembroke Street during Spring, 2017. I would like to express my profound thanks to all those members of professional support and academic staff who have worked very hard to ensure that we can teach effectively this Term. The fact that the Department is temporarily on four separate sites places a great strain on operations, and many are doing sterling work in coping with this problem."*



New MBE intake in their pristine new teaching room

Front Cover Article



HoD and academics welcome all new graduates at Reception in new building lobby, 6 October 2016

Both staff and students kicked off the new academic year in style from the sparkling new site in West Cambridge equipped with modern teaching facilities: On 5 October 2016 the first undergraduate sessions took place in the shiny new lecture theatres. On Thursday 6 October Dr Mark Williamson had the honour of giving the first proper lecture. There was also a drinks reception with a formal graduate student welcome from CEB HoD, Professor Dennis. The social spaces on the lower ground floor are outstanding, as are other breakout areas.



Staff and students enjoy mingling in the open social spaces

The laboratory block in the new building still remains under the control of Estate Management whilst the builders complete their work. As noted above, research activities have not yet been moved and so will remain in the old sites Pembroke Street, Tennis Court Road and the Magnetic Resonance Research Centre (MRRC) until the new laboratories are ready. Once the research has been moved, the only off-site facility that will remain part of CEB is the MRRC.

The address of the new building in the West Cambridge Site is: Philippa Fawcett Drive, Cambridge, CB3 0AS. An official opening of the new building will take place in 2017 and we shall give more information about this in due course.

For up-to-date information on the move see www.ceb.cam.ac.uk/about/vision2016



The BP Perry's Chemical Engineers' Handbook' prize presentation in new building lecture theatre, 6 October 2016

CUCES Garden Party

Pawat Silawattakun



CET IIB students enjoying the afternoon with drinks and snacks

CUCES organised their first ever garden party (kindly sponsored by BP) on Thursday 16 June, in Magdalene College Fellow's Garden. This was a very enjoyable and relaxing event, despite the heavy rain during the latter half of the event, which had the party swiftly relocated to a marquee. Lecturers and students from all different year groups in the department came together for the party. Some tried their hand at croquet, whilst others settled for a game or two of Jenga on the grass. However, the highlight of the event was definitely the wide selection of food and drinks; in particular, freshly mixed Pimm's with sliced fruits, and the strawberries and cream.

The garden party was the last CUCES event the fourth years attended as their time as students drew to a close. We wish them good luck with their future careers, and hope to see them return as alumni in the near future!

With almost fifty people turning up, the garden party proved to be as popular as the usual June BBQ event, and we will consider making this an annual event. We also would like to apologise for organising the event on the day where a lot of our lecturers could not come due to an examiners meeting.



The CUCES Committee makes the best out of the stormy weather

Design Project 2016 Prize Winners



CET Part IIAs and supervisors celebrating the end of their design projects

The winners for the best undergraduate design project presentation this year were: Syed Jafri, Pey Ling Ng, Cameron McCormack, Alan Wong, Andrea Premoli, and Yangfan Zhou (Group I). The Design Project is a major part of the coursework for Chemical Engineering students in their third year at Cambridge. This year, it was supported by Invista, one of the world's leading companies in nylon, spandex, polyester and specialty materials. This year, the task involved manufacture of polyethylene terephthalate (PET) from pure terephthalic acid (PTA) and ethylene glycol (EG). PET is a common thermoplastic polymer resin of the polyester family and is used in fibers for clothing and containers for liquids and foods.

Pey Ling Ng, a prize winner said: *"The design project has taught me to face uncertainties with an open mind, make sound engineering assumptions and most importantly, integrate theoretical knowledge into the real-world context. I have also learnt to prioritise my work, be more resourceful and focused on the bigger picture rather than all the little details. Additionally, the project gave me an opportunity to get to know and work with more people! All in all, it was a very good and fulfilling learning experience!"*

Undergraduate Focus

Summer Internship Experiences



Yao Xiao, AIST Internship Program

I was very lucky to join the internship program by National Institute of Advanced Industrial Science and Technology (AIST) in Tsukuba, Japan. I joined a research unit, whose topic is methane-to-benzene (MTB) technology. It is such an amazing idea to directly change methane into benzene, as clearly benzene is way more useful than methane. I was responsible for the whole process of evaluating new catalysts. Most of my time was spent on tracking the performance of catalysts with different ratios of active materials. A typical sample test would take more than 6 hours to be done. The preparation of a catalyst also took multiple days. In short, MTB catalyst development is rather time-consuming, so time management became very important. One particular catalyst survived 10 hours before its activity dropped down to 50%. It was a perfect result, but I missed dinner that day.

Other than the project itself, the life in Tsukuba was also a whole new experience for me. Although the academic atmosphere in Tsukuba is pretty similar to Cambridge, Japanese people are quite different from the British (but they all like to drink, too!) Very sadly, August is the hottest month in Japan. It does require a little courage to go out on a 39°C day.

Working in a different country is an excellent opportunity for undergraduate students. I will definitely recommend everyone to apply for it - but maybe not during August in Japan!



Olivia Situmorang, Shell Assessed Internships (Well Engineering)

During my Shell internship in Aberdeen I worked in the Wells discipline which is responsible for designing, drilling and completing wells prior to the production of hydrocarbons from reservoirs in the North Sea. Within Wells I was placed in the Completion Design team, which carries out Front End Engineering Design of well completions. My project involved carrying out a comparative assessment and making recommendations of interventionless devices (plugs and sliding sleeve doors) which are remotely operated from surface and reduce the need for wireline intervention in completions. These devices reduce the exposure of wireline hazards to people and also help generate savings of up to over £1 million per well.

I was assigned a supervisor and a mentor to support me with the technical understanding of my project and provide me with feedback on my performance. Additionally, I was able to collaborate not only with people in Shell UK, but also with engineers in Norway and Houston.

Outside of my project scope I had the opportunity to visit the St. Fergus gas plant and volunteer with Shell at the TechFest STEM festival. I was able to build valuable networks which involved people such as senior leaders and others globally beyond Shell UK. I also took the initiative to organise a careers talk with the Business Advisor to the Upstream Director, which was targeted towards the interns and graduates at Shell.

This internship allowed me to improve my ability to work in a large professional environment, engage my stakeholders and manage projects. I highly enjoyed working on a challenging but impactful project, and overall had an extremely fulfilling experience at Shell.

CDT Grad performs at Fringe Fest



Sensor Centre for Doctoral Training (CDT) Grad student Gemma Goodfellow performed in Edinburgh's Fringe Fest in a show called "Alice" for two weeks in August. She performed in the gymnastic chorus and silks chorus act¹.

Gemma stated; *"I started doing gymnastics again when I began my MRes this year. It had been a little while since I had trained as I had my daughter in 2013! I had the opportunity to be part of "Alice" as a part of the ADC theatre production in January. The show was a massive success and we received 5 star reviews. So the cast applied for funding from CUADC to perform at the Fringe Festival. We were lucky to be awarded the funding which covers the venue costs. I then applied for funding from my college to attend and was lucky to receive the Tizard Student Opportunities fund to cover my accommodation costs! This award was given by alumni in honour of the first Senior Tutor of the college, Dick Tizard.*

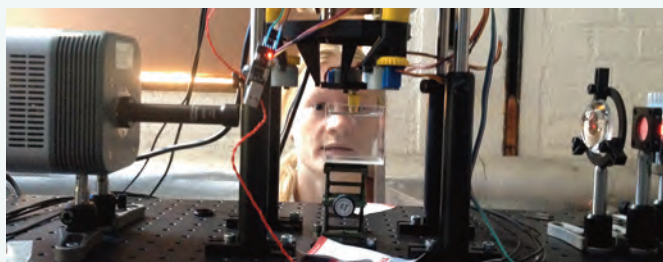
I am really excited to perform in the Edinburgh Fringe festival. When I returned to study this year after quite a long break, I never imagined that I would be given the opportunity to perform in such a prestigious event alongside studying as part of the Sensor CDT."

¹ www.ceb.cam.ac.uk/news/news-list/edinburgh-festival-august-2016

GradSoc Elections

The CEB (GRSoc) Graduate Researchers' Society Committee for 2016/17 will consist of Rittick Barua (President), Arthur Kouyoumdjian (Secretary), Andi Reci (Treasurer), Pierre Brauer (Graduate Conference Officer), Jennifer Holian and Georgina Cuckston (SSCC Representatives), and Jordan Ward-Williams (Webmaster). Craig Russell will continue as the Syndicate Representative until end of the Michaelmas Term. Petar Besevic, GradSoc President for 2015/16 stated: *"Throughout this last year the Graduate Researchers' Society has made a positive contribution to the Department; the Graduate Conference and Summer Barbecue were academic and social highlights. Thanks to all of the members of the 2015/16 Committee for their time and efforts and best of luck to the incoming committee!"*

Development of a 3D Microscope to study biological Samples



Aligning the OPT

This year's Sensor CDT "Team Challenge" is to develop and build a truly open-source, low-cost and high-resolution 3D microscope capable of studying biological samples. The concept behind this microscope is Optical Projection Tomography (OPT), a method similar to X-ray computerised tomography (CT) and first described by James Sharpe while at the University of Edinburgh in 2002.

A stack of 2D optical images is taken of the sample from different angles in transmission or fluorescence mode. A computer then transforms this image stack into a 3D image. OPT allows samples with a thickness of several millimetres to be imaged with a spatial resolution of 10 microns. In contrast to confocal microscopy, no slicing of the sample is necessary. However, most biological samples have to be cleared using organic solvents before being used in OPT.

While the concept of OPT is not overly complex, only about 30 commercial OPT systems have been manufactured since. The hardware design of an OPT setup is open-source, but with a price tag of ~£50k and using MATLAB and LabVIEW is not affordable for many laboratories. The 14 students from the second Sensor CDT cohort are currently spending three months to develop, build and test a competitive system with a price tag of £5000 using only open source hardware and software. They use cost-effective of-the-shelf opto-mechanic hardware and adapted a 3D printed microscope stage to position and rotate the sample. Software control for the OPT setup, i.e. sample positioning and rotating and image acquisition, is written in Python running on a Raspberry Pi. Images are reconstructed with a Java plugin which integrates into the widely used open-source image manipulation software ImageJ. Initial 3D images of *C. elegans* and pancreatic organoids show that the system works according to the specifications. The remaining task is to test the performance of the setup with affordable scientific cameras.

PhD student Lucky Strike



Merck Innovation Cup: Team Global Health and supporters. Back row (from left to right): Ulrich Betz (Head of Innovation & Entrepreneurship Incubator, Founder and Manager of the Innovation Cup), Jutta Reinhard-Rupp (Head of Translational Innovation Platform Global Health), Josh Tycko (PhD, Stanford University). Front row (from left to right): Chetan Rathi (PhD, University of Tennessee), Erica Namigai (PhD, University of Oxford), Belén Garijo (Member of the Merck Executive Board, CEO Healthcare), Theresa Maier (PhD, University of Cambridge), Jennifer Beveridge (PhD, Georgia Institute of Technology), and Gabriele Disselhoff (Coach for Team Global Health).

WD Armstrong Scholar and CEB PhD student Theresa Maier was recently chosen through a multi-stage selection process to participate in a series of highly selective biopharma events: the Merck's Biopharma Innovation Cup, Roche Continents and the Novartis International Leadership Biocamp¹. All three are the

biopharma's flagship events, only selecting the most outstanding students globally.

Theresa Maier stated: *"I am so honoured to be able to engage with like-minded students and industry experts from all over the world in an inspiring environment which encourages innovation and gives us an unparalleled opportunity to achieve global impact."*

Merck Innovation Cup

From 3-8 July 2016, Theresa joined a selected group of 30 PhD students, MBAs and Postdocs, chosen from over 900 applicants globally to generate new ideas in the areas of Oncology, Immuno-Oncology, Autoimmune Diseases, Chemo- and Bioengineering, Emerging Markets and Global Health. During the final presentation at the Merck KGaA headquarters in Darmstadt/Germany, Theresa's five-member team inspired the audience with their novel approach to controlling schistosomiasis transmission. As the winner of this year's Merck Innovation Cup, Theresa's team was awarded 20,000 € and the opportunity to pursue their innovative idea supported by Merck.

Roche Continents

Every year, Roche invites 100 students across 50 European countries to Salzburg/Austria to experience a unique journey exploring sources of inspiration at the intersection of science and art, creativity and innovation. "Roche Continents" (10-16 August 2016) comprises an interdisciplinary programme including workshops and lectures in the arts and science, and coincides with the Salzburg Festival, one of the world's most famous music festivals inaugurated in 1920.

Novartis International Leadership Biocamp

BioCamp is Novartis' pioneering global four-day seminar held 28-31 August 2016 at the Novartis International Headquarters in Basel/Switzerland. BioCamp provides the opportunity to gain insight into the drug development process of a global pharmaceutical company, to interact with the key Novartis professionals, and get to learn about trends and challenges in the healthcare sector. In addition, all participants - a total of 60 students from over 30 countries worldwide - will take part in a business plan competition, simulating the development and launch of a novel pharmaceutical product.

¹ www.ceb.cam.ac.uk/news/news-list/theresa-maier-wins-global-merck-innovation-cup

Undergraduate Course Accreditation

Dr Patrick J. Barrie, Director of Teaching



The IChemE has recently reaccredited our undergraduate course in Chemical Engineering at Master's level. This means that students passing the four-year course, including the design components, can apply for Chartered Engineer status after gaining relevant experience without taking any further examinations.

Our undergraduate course has been accredited at Bachelor's level for the first time. This benefits undergraduates who leave after passing the three-year course if they then take an appropriate Master's level qualification at another University. The accreditation process checks that the course content is academically sound and industrially relevant. It also reviews the standard of teaching and assessment.

To this end, it is required that the Bachelor's level course contains sufficient material that can be categorised as "Chemical Engineering Core", "Chemical Engineering Practice" and "Chemical Engineering Design". It also requires appropriate underpinning Mathematics, pure Science and Engineering and some "embedded learning".

In the Master's level programme, it is further required that the course contains sufficient Advanced Chemical Engineering material that can be categorised as "Depth", "Breadth", "Practice" and "Design".

As well as paperwork, the accreditation process involved a two-day visit to the Department by an Assessment Panel that consisted of three experienced chemical engineers. They reviewed course content, checked quality assurance, appraised safety matters and talked with staff and students. The Assessment Panel produced a written report for IChemE that was, then, considered by the accreditation forum. Some comments in the Assessment Panel's report included:

- "The panel was impressed by the commitment and interest of the staff in their teaching and in the welfare of their students."
- "The direct technical and administrative support within the Department is significant and of a high standard."
- "The students met by the panel were very eloquent and thoughtful and provided a very positive view of the programme."

- "The Department appears to have a very thorough and careful approach to assessment and fairness of standards across all years."

The recommendations made include the range of laboratory experiments, the level of detail provided in the main design project and the allocation of advanced design components between years.

Our course has now been accredited since 1962. The new accreditation is valid for five years, starting with students in October 2016.

Chemical Product Design: Past and Present

Professor Geoff Moggridge, Structured Materials Group



Chemical Product Design was first taught in the final year of the Old Regulations Part 2, 1998-99, when students spent only two years in the Department. The course came about

because Zeneca sponsored Professor Ed Cussler to spend a sabbatical year here to develop teaching which would better suit the needs of their company. The lectures were structured around providing a template, which would allow students to attack product-related design problems. 16 students took the course and as groups of four worked on products of interest to Zeneca as their Research Projects.

The first evolution of the course was to include writing a business plan as part of the design process – this has now been delegated to the Judge Business School in the Entrepreneurship option available in Part 2B. Next came the differentiation of different product types based on the scale of the key active component: molecular products, microstructures and devices. Emphasis was placed on environmental as well as economic consideration in what makes a successful product. These changes formed the basis of a second edition of our book, published in 2011. Recently, biochemical products have taken a greater role in course, as a result of Dr Graham Christie's contribution, consistent with our merger with the Institute of Biotechnology.

The course is now compulsory as part of the core component of Part 2B and is also part of the IChemE advanced design requirement for course accreditation. Assessment is based on a series of short exercises around the design template and the product types, requiring group work and/or concise oral presentations.

Research Highlights

Looking into Washing-up

Professor Ian Wilson, P⁴G (Paste, Particle and Polymer Processing Group)



SFDG in Action

A paper from the Paste, Particle and Polymer Processing group (P⁴G) has been awarded the 2015 Distinguished Paper Award by the American Cleaning Institute for their paper entitled 'Using the scanning fluid dynamic gauging

device to understand the cleaning of baked lard soiling layers' published in the American Oil Chemists' Society's Journal of Surfactants and Detergents. The authors are Akin Ali and Professor Ian Wilson from P⁴G along with Glenn Ward and Zayeed Alam from Procter & Gamble's Newcastle Technical Centre.

The work describes part of Akin's PhD work investigating the cleaning of hydrophobic food soils from kitchenware, in essence the science behind dishwashers. Akin generated model food soil layers by baking lard under controlled conditions: the resultant polymerised mixture of fatty triglycerides exhibits complex rheology and solubility. They don't clean off easily (which the reader may be familiar with).

The work employed the scanning fluid dynamic gauging device (SFDG) developed in P⁴G by Patrick Gordon to study how different aqueous solutions interact with these hydrophobic soils. SFDG yields real time information on layer thickness and strength at several different points on a surface. Akin showed that certain surfactants promote detachment by peeling via ingress at the soil-substrate interface, whereas others weaken the interactions within the soil, facilitating erosion by fluid flow. Curiously enough, mixtures of ingress and erosion promoters showed antagonistic rather than synergistic effects. This information can be used by companies like P&G to develop detergent formulations for cleaning these soils more effectively. The findings have results in a follow up Industrial CASE project with P&G on elucidating the mechanisms. Other related projects in the group include quantitative studies of fluorocarbon based anti-fouling surfaces (think of Teflon (R)) with Chemours (formerly part of Du Pont) and cleaning of hydrophobic pharmaceutical products with GSK.

The paper in question can be accessed on www.link.springer.com

See P⁴G group profile on

www.ceb.cam.ac.uk/research/groups/rg-p4g

TeraView Patent to support Drug Formulation

Dr Axel Zeitler, Head of Terahertz Applications Group



Terahertz Equipment

Cambridge Company TeraView has licensed a new University patent application for formulation of drug molecules as amorphous materials that was developed in the

Terahertz Applications Group. The aim of the method is to help improve the speed of drug formulation, lifetime of drug products and the efficiency of manufacture.

The patent inventors are CEB lecturer Dr Axel Zeitler and Postdoc Dr Juraj Sibik (Dr Sibik has since taken up a position at Roche in Basel, Switzerland) and their invention is a new method of using terahertz spectroscopy to investigate the stability of amorphous materials, which can be used as active ingredients in drugs. Amorphous ingredients have the potential to increase bioavailability (absorption by the body) of poorly soluble drugs when administered orally in the form of tablets or capsules.

Commenting on the collaboration with TeraView, Dr Zeitler stated; "Our work on amorphous materials has proven to be of great interest to the scientific community, in both its applications to materials science as well as the terahertz spectroscopy methodology. We have also had substantial interest from pharmaceutical companies. Our long-standing relationship with TeraView, and its position as the leading provider of terahertz solutions, makes TeraView a natural partner to make our invention available to the wider industrial community."

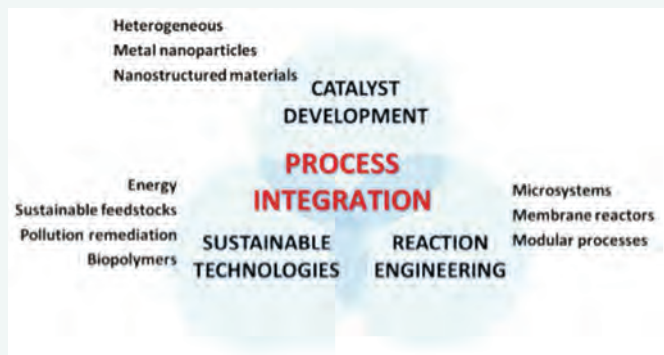
Dr Phil Taday, Principal Scientist and Head of Applications at TeraView, said "Understanding the stability of amorphous materials is clearly of increasing importance to the pharmaceutical industry. TeraView sees this patent as an important addition to our portfolio, with interest shown already by major pharmaceutical companies."

TeraView's CEO, Dr Don Arnone, commented; "This agreement further solidifies our relationship with Dr Zeitler's group, and we are proud to be associated with his team. This collaboration, where we have provided TeraView systems and other means of support, is a very good example of the sort of collaboration we seek to establish with world experts in their fields, such as Dr Zeitler."

More information on TeraView on www.teraview.com

Catalysis and Process Integration – a Year on

Dr Laura Torrente-Murciano, Process Integration Group



Process integration is conventionally defined as a range of systematic design methods to synergistically combine different process needs, increasing the overall energy efficiency and decreasing its environmental impact. Our research philosophy follows this mindset with a renewed perspective beyond this traditional approach. The group combines aspects of catalysis development (nanostructured materials and metal nanoparticles) with reaction engineering (membrane reactors, microdevices and modular processes) to enable a range of new sustainable technologies in the fields of renewable energy, air pollution remediation and bio-derived feedstocks amongst others.

One of our main efforts, as part of an *EPSRC Fellowship*, is the development of a novel manufacturing technology for the continuous synthesis of nanoparticles with controllable sizes and tuneable chemical compositions. Currently, controllable particles' growth and agglomeration is only possible in the presence of stabilising agents. However, such capping ligands normally interfere in the final application (e.g. catalytic reactions, biomedical, imaging). Our approach consists of the exploitation of laminar flow in microdevices for the continuous synthesis of metal nanoparticles in the absence of capping ligands integrated with their in-situ stabilisation following a novel method recently developed in the group in a single device. Guided by fluid dynamic simulations, we design novel microdevices to reach a compromise between laminar and turbulent secondary flows to achieve narrow particle size distributions with minimal

agglomeration. 3D printing tools allow us to link simulation and experimental data in a self-feeding optimisation system.

Another research area that captures most of our interest, is the use of ammonia as a hydrogen vector in the context of sustainable energy. Despite its high hydrogen content (17.6 wt %), the implementation of ammonia as feed for fuel cells is currently limited by the high temperature required to release hydrogen. By combining mechanistic studies, design of catalysts and nanoparticle size control, we have recently reported a system capable of producing on-demand hydrogen at temperatures as low as 180°C. A new EPSRC grant, in collaboration with Bath and Liverpool will now allow us to integrate the production and in-situ purification of hydrogen from ammonia within the current fuel cell technology and also explore other waste-to-energy routes as part of the big renewable energy landscape.

Moving to Cambridge, almost a year ago, was a milestone for the group, but also a challenging time. Most of the group members either graduated or remained at the University of Bath and efforts focussed on setting up a temporary lab. Thanks to the support of the department and technicians, the transition has been smooth and we are now well integrated (as you can see us punting!). New collaborations across the University and new funding is allowing us to build up the group again. Overall, it has been an exciting year and now we are looking forward to the next stage in the new building.



Dr Torrente (front far left) with her research team

Say Cheese

Dr Ljiljana Fruk, BioNano Engineering Group

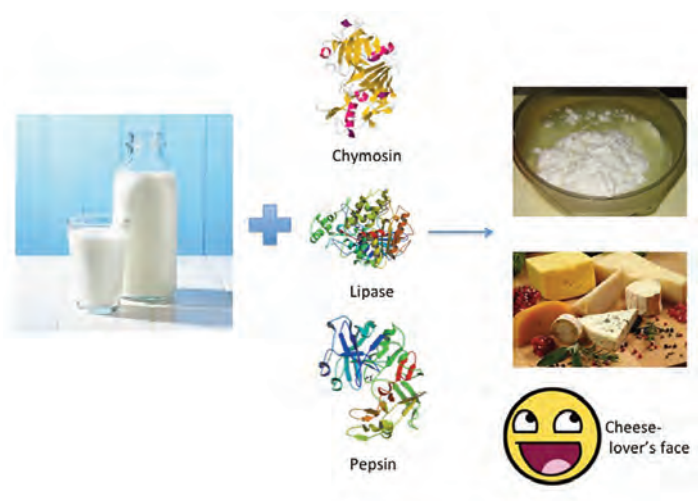
At a recent dinner, a friend of mine said he had a confession to make. Curious about what the life-changing story to follow would be, I gave him all of my attention only to hear that the dinner was great but that I failed to choose the right cheeses. I should have known that this would if I invited a passionate cheese lover (and believe it or not, they even have a word to describe themselves: “*turophiles*”). However, being a scientist who likes to turn failures into successes, I have decided to learn a little and build a new relationship with cheese. So, this is what happens when a “*turophile*” challenges a “*philomath*”.

I have started from History and it turns out that the origin of cheese-making is another story in world-changing biotechnology. I was never a big fan of cheese and I blame it on my hidden Asian genes (not handling alcohol well either). Namely, cheese making was never a world-wide biotechnological event and, still, it is not part of a regular Asian diet, although there is some evidence of a cheese called “*rushon*” being produced in China during the Ming Dynasty (14-17th century). It is hard to say exactly how the first cheeses were made but like all things great, it was probably a matter of pure chance. Theories say that it was made as a result of European tribes storing milk in containers made of animal stomachs. This must have happened during the animal domestication period, around 8000 to 10000 years ago (there is pictorial evidence found in Egyptian tombs dating back 4000 years). The stomachs of ruminant animals contain rennet, a mix of different enzymes such as chymosin, pepsin and lipases, which together with low acidity (either still present in not entirely clean stomachs or later produced by the addition of fruit juices or vinegar) caused milk to coagulate (chymosin breaks down casein on the surface of the casein micelles turning them from hydrophilic into hydrophobic) and separate into curds and whey.

At a later point in history, most probably during the Roman Empire when cheese-making was a highly valued skill and hundreds of cheeses were produced and traded, some form of bacteria was added together with the rennet (or pieces of calf stomach),

which then converted milk sugars into lactic acid. The choice of bacteria is also very important for the ultimate flavour: the breakage of casein proteins and milk fat into a complex mix of molecules gives those special characters to different cheeses.

I cannot help but wonder how the first cheese maker designed his/her experiment to get it reproducible and tasty. However, reading about cheese and most importantly, after doing extensive cheese tasting in the past few months (found some wonderful Croatian varieties this summer), has made me think about all those small chance events that have transformed our civilisation. And while writing this now, I am snacking on wonderful Comté and I have just realised I have discovered a bit of a “*turophile*” in me as well.



www.food.ndtv.com/ingredient/milk-701257-milk
www.starmarket.com/cheese-shop-deli-cheese

References (Wikipedia)

“*turophile*” - a connoisseur of cheese, a cheese fancier.

“*philomath*” - lover of learning and studying.

Fluid Dynamics in High-Impact Publications

Dr Silvana Cardoso, Fluids and Environment Research Group

The research work of the Fluids and Environment Group is concerned with the motion of fluids in the natural environment, e.g., in the atmosphere, oceans and subsurface. Current studies include the behaviour of methane plumes in the ocean, the role of submarine osmotic and buoyant circulation, and the acceleration of carbon-dioxide movement in the subsurface by geochemical reactions. The over-arching aim of our work is to understand the impact of these flows on the global warming of the Earth.

In preparation for the next Research Assessment, the Fluids and Environment Group has recently published 4 very high-impact publications, with a total impact factor of 70; this is an outstanding achievement. The context and contribution of each publication is summarised below.

1) Cardoso S.S.S. and Andres J.T.H., 2014, Geochemistry of silicate-rich rocks can curtail spreading of carbon dioxide in subsurface aquifers, *Nature Comm.* 5:5743 (impact factor 11.3). This study is concerned with carbon-dioxide storage in saline aquifers (Figure 1). It demonstrates for the first time that geochemical reactions can slow down efficiency of storage.

This work has been acclaimed by IChemE President, Prof. Geoff Maitland (2015): 'Some of the best work being done in carbon capture and storage (CCS) is helping us to question whether the assumptions we make are correct. Research from the Department of Chemical Engineering and Biotechnology at the

University of Cambridge suggests that natural geochemical reactions can delay or even prevent the spreading of carbon dioxide (CO₂) in subsurface aquifers. ... It is excellent to see work like this being completed and I hope that it can go on to help us make better and more efficient decisions over where to place our CCS sites.' (www.ichemeblog.org/2015/01/20/the-complexities-of-carbon-capture-and-storage-day-238/)

2) L. M. Barge, S. S. S. Cardoso, J. H. E. Cartwright, et al. 2015 From chemical gardens to chemobrionics. *Chemical Reviews*, 115:8652–8703 (impact factor 37.4). This comprehensive review is concerned with the interaction of chemistry and fluid flow in chemical gardens, and its role on the emergence of chemobrionics.

3) Yang Ding, Bruno Batista, Oliver Steinbock, Julyan H.E. Cartwright, Silvana S.S. Cardoso 2016 Wavy membranes and the growth rate of a planar chemical garden: Enhanced diffusion and bioenergetics. *Proc. Nat. Ac. Sci.* 113 (33), 9182-9186 (impact factor 9.4). This work focuses on the behavior of wavy membranes in hydrothermal vents (Figure 2). It shows that dispersive transport of chemicals was fundamental to early cell development. Comments from the former head of the genome project in the USA, Prof. Elbert Branscomb (2016): 'This is ... a very impressive, interesting, innovative, and significant work. Such ... "classical" Science..., with ... elegant experiments and subtle theory. A true delight.'

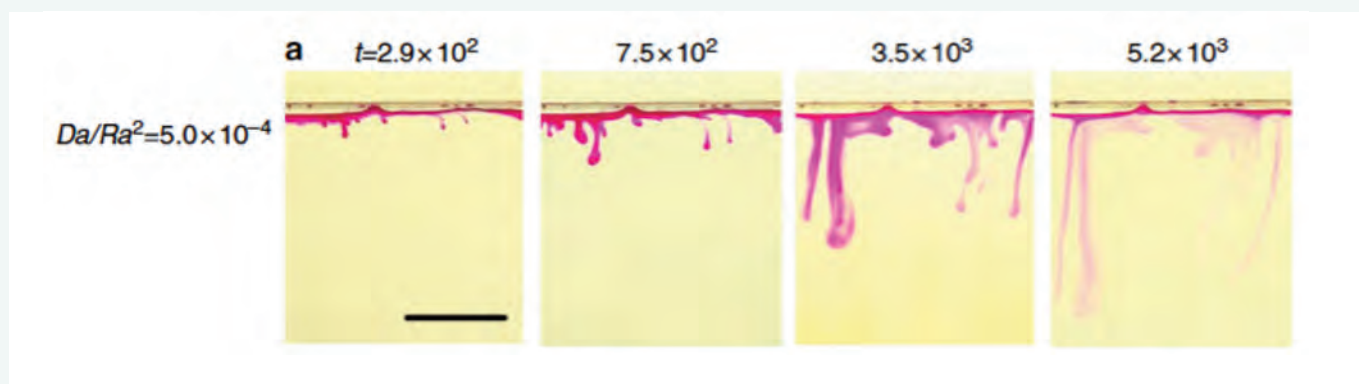


Figure 1. Sequence of photographs demonstrating the spreading of carbon dioxide in a porous reservoir, at increasing dimensionless times. Scale bar, 2 cm

Research Impact

4) 2016 Nature Communications - in press (impact factor 11.3). This is a study on the impact of flow under the seafloor on climate change.

The Fluids and Environment Group also holds a high number of publications in the Journal of Fluid Mechanics (JFM); JFM is the most prestigious journal in the field. This research has focussed on problems such as the BP oil plume in Gulf of Mexico, the Fukushima nuclear cloud, and on the fundamentals of bubble plumes (Figure 3).

The Fluids and Environment Group is expanding this October with 4 new enthusiastic PhD students, who will be continuing this excellent research. Our work is funded by the Leverhulme Trust, EPSRC and FCT (Research Council, Portugal).

See group profile on www.ceb.cam.ac.uk/research/groups/rg-feg

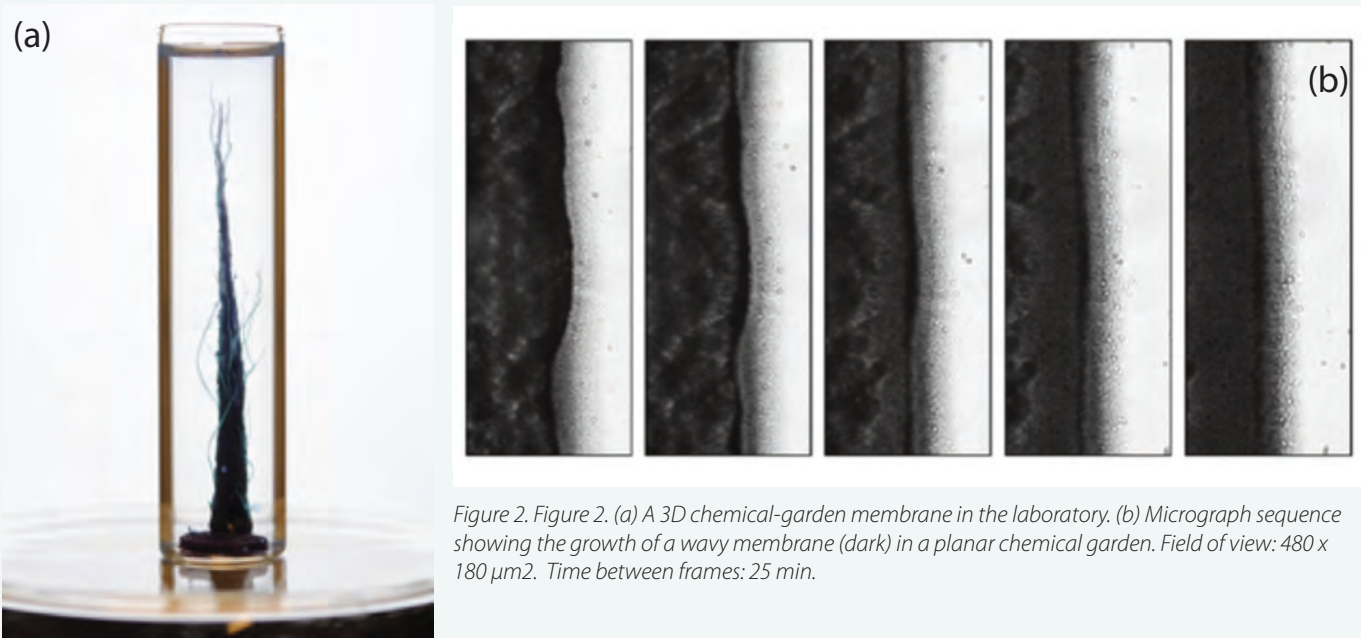


Figure 2. Figure 2. (a) A 3D chemical-garden membrane in the laboratory. (b) Micrograph sequence showing the growth of a wavy membrane (dark) in a planar chemical garden. Field of view: 480 x 180 μm^2 . Time between frames: 25 min.

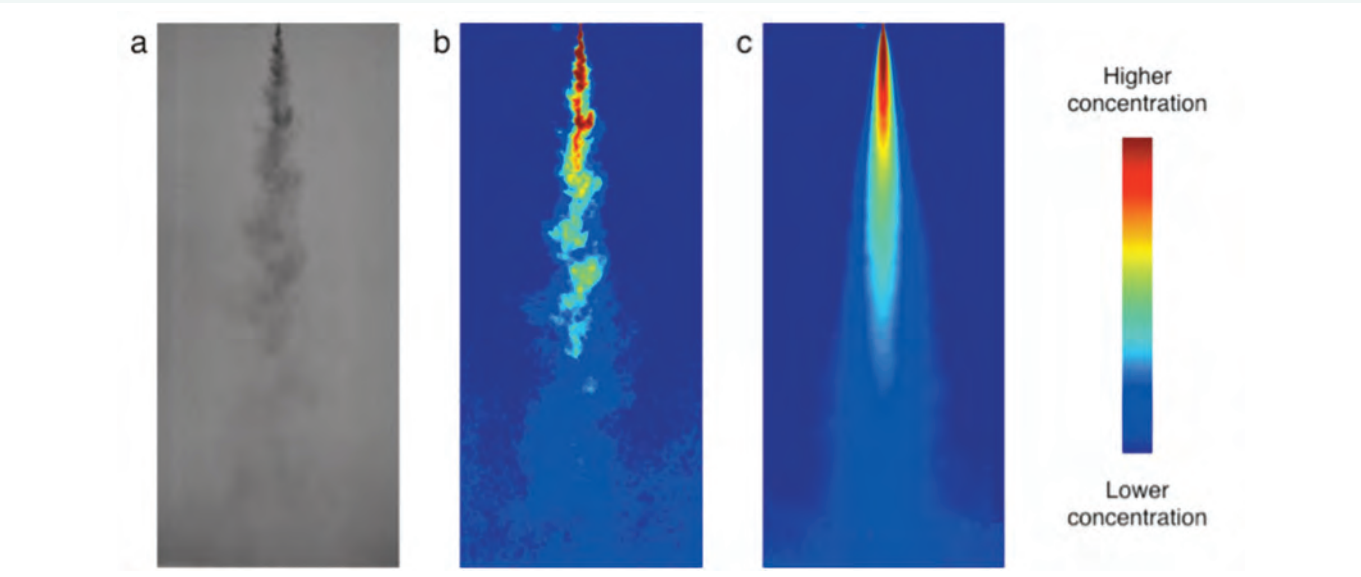
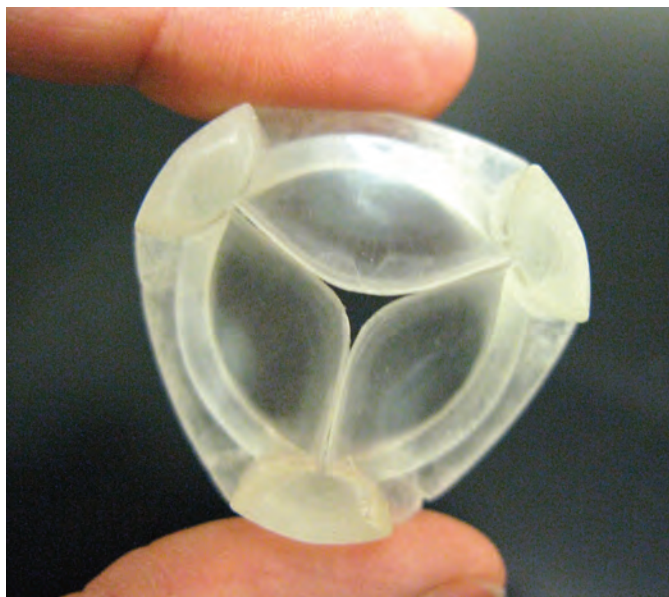


Figure 3. (a) Photograph of a reactive turbulent plume; (b) Instantaneous distribution of the plume fluid; (c) Time-averaged distribution of the plume fluid

Providing a commercial Angle

*Dr Olivia Nicoletti, Technology Associate,
Cambridge Enterprise*



Dr Joanna Stasiak, Structured Materials Group, holds a prototype polymeric heart valve she has just made

Cambridge Enterprise (CE) helps staff and students commercialise their ideas and share knowledge gained from research. Are you looking to license intellectual property? Have you been approached by an organisation that wants your advice? Or do you have an idea you'd like to develop? CE can help.

Cambridge Enterprise has supported a number of projects from the Department of Chemical Engineering and Biotechnology, including the work on innovative heart valve materials and designs developed in the laboratory of Professor Geoff Moggridge by supporting its patent protection, as well as supporting several successful grant applications. It is through CE that many of the University's inventions have been protected, and also how funding has been acquired by start-ups and spin-outs.

Teams within Cambridge Enterprise bring together expertise in funding, consultancy services and IP management and licensing, to offer high quality support to the University's staff, students and affiliates who want to commercialise their research or share their knowledge. It's never too early to get in touch with us, enabling us to advise you on the best routes for commercialisation.

Do you want to start a company? Cambridge Enterprise Seed Funds supports students and academics through direct investment as they build teams and raise the finances they need to develop products from their research and build spin-out companies. It creates partnerships and links entrepreneurs with University seed funds and sources of angel and VC investment, as well as a network of mentors and management.

Or perhaps you're looking to work as a consultant? Our Consultancy Services team gives staff, researchers and students support to use the expertise and know-how gained in research to provide advice to help external organisations; this includes but is not limited to fee-based expert witness advice and serving on scientific advisory boards. The team handles business negotiations, contracts, collection and distribution of fees and other administrative tasks that can otherwise distract from the transfer of knowledge.

Need help managing your intellectual property (inventions, patents, licensing)? Our Technology Transfer teams help researchers develop their ideas, technologies and inventions into opportunities that are attractive to industry and investors. Made up of two teams, Life Sciences and Physical Sciences, our Technology Transfer people provide help with developing commercial strategies, IP management, proof of concept funding, assisting with the formation of new companies and negotiating licensing opportunities.

Dr Maggie Wilkinson and Julian Peck are the main contacts for Chemical Engineering and Biotechnology at CE, and Dr Geoff Moggridge and Dr Graham Dransfield in the department are Enterprise Champions: part of a network of academics, researchers, facilitators and co-ordinators who can act as a first point of contact.

So whether you have an idea that's still germinating, expertise to share with organisations, technology with intellectual property that needs protecting, or are ready to start a company and get your ideas to market, Cambridge Enterprise can help you achieve success. Find us at www.enterprise.cam.ac.uk

Sensors Tech for independent Living



Assisted living project presented at the 2015 Sensors Day

The financial, societal and health impacts of an ageing population are a challenge for many countries. One solution is assisted living technologies which allow older people to enjoy an independent life in their own home for longer. Commercial products in this area typically offer proprietary solutions which tie users to one provider and often lack the flexibility to adapt the technology to the evolving needs of the older person.

Academic and industrial members of the Sensor CDT gave the first cohort of students the “Team Challenge” to develop sensors for assisted living. The brief for the ten MRes students was deliberately broad, forcing the students to scope and manage the project themselves – a valuable skill for their upcoming PhD projects. The initial idea around smart wrist bands was abandoned after mentors from the care profession pointed out that older people would forget or refuse to wear them. Instead the students turned their attention to a sensor suite which could monitor activities inside the house without invading the person's privacy^{1,2}. Data such as temperature, light and sound levels, door status and the usage of key electrical equipment is collected, uploaded, processed and stored on a web server. Friends, family or health professionals can access the data to detect abnormal behaviour, e.g. curtains not being opened in the morning, increased movement during the night, or a kettle not being used. A small and low-cost on-person fall detector was developed, using machine learning to discriminate between an actual fall and sitting or lying down motions. A user friendly communication device with only two buttons to phone a predefined number and send the person's GPS location was designed for the outdoors, e.g. shopping trips.

The outcome of this 17 week long Team Challenge has been published in the Royal Society journal *Interface Focus*³ (DOI: 10.1098/rsfs.2016.0018) and since featured in the media and attracted interest from health care professionals. Oliver Bonner and Josie Hughes also gave an interview at Cambridge TV, giving an overview of the project⁴. The results are open source, allowing others to replicate and improve the existing system.

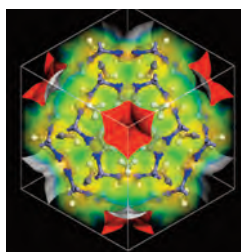
¹ cdt.sensors.cam.ac.uk/news/sensor-cdt-students-publish-research-from-the-sensor-team-challenge

² www.ceb.cam.ac.uk/news/news-list/students-invent-new-sensor-technology-to-improve-later-life

³ rsfs.royalsocietypublishing.org/content/6/4/20160018

⁴ www.cambridge-tv.co.uk/oliver-bonner-and-josie-hughes-integrated-technologies

MOF Innovation in the Media



Dr David Fairen-Jimenez's was recently interviewed at BBC radio about the latest advances on metal-organic frameworks (MOFs).

He is the leading PI of the Adsorption & Advanced Materials Lab (AAM) at CEB and

also a Royal Society University Research Fellow. BBC Radio broadcast featured his work with MOFs and told about his research interests, mainly focused on evaluating novel strategies in the design and development of advanced materials and supramolecular assemblies such as MOFs. He is also looking at creating new experimental and computational methods for the prediction of their performance. There are obvious energy-related applications of his research, which also covers the development of novel drug and siRNA delivery systems for cancer diagnosis and therapy. His work has been published in several high-impact journals like *Angewandte Chem.*, *JACS*, *Chem. Commun.*, etc. He has 55 publications and his innovation has attracted a considerable amount of industry interest – also receiving both the RSC Emerging Technologies 2015 and the SusChem – Innova Awards.

See his profile on www.ceb.cam.ac.uk/directory/david-fairen-jimenez and the news story on CEB web www.ceb.cam.ac.uk/news/news-list/radio-david-f-j-july-2016

CEB-Infinitus Collaboration thriving



Cambridge
Inifinitus
Research Centre
(CIRCE) was

established through a collaboration between the Department of Chemical Engineering and Biotechnology and the Chinese Health Company, Infinitus (China) Company Limited. The partnership became official at a signing ceremony on 3 September 2015.

The research contract is worth more than £4 million and it is focused on analysing the biological activity of polypeptides and polysaccharides derived from plants and fungi. 25% of all modern medicines are derived from natural products. The research aims to study molecular regulators of protein homeostasis in cell and organism models that could be critical in the treatment of diseases such as Parkinson's and Alzheimer's.

The agreement also included a significant donation towards the construction of the Department's new building in West Cambridge.

The centre is led by Professors Alan Tunnacliffe and Clemens Kaminski and utilises the expertise in cell biology from Dr Gabi Schierle Kaminski's group, who is the Director of Operations. Professor Kaminski's group offers expertise in advanced molecular imaging techniques.

In broad terms, the research work is broken down into peptide purification and characterisation, high-throughput compound screening for metabolic and protective functions in *C.elegans* and cell models and investigations of functional mechanisms on lead compounds of interest to Infinitus using state-of-the-art visualisation experiments.



First CIRCE meeting in the new building boardroom

The first research strategy meeting in the new building in West Cambridge was held on the 20 September 2016. Senior representatives from Infinitus and CIRCE key staff met to discuss research achievements and to plan future activities. To date, CIRCE has been successful in creating a new cell model to test for protein aggregation using stable cell lines expressing poly-Q protein, which can be used to research aspects of Huntington's disease, neurodegeneration and aging.

On the technology front, a significant breakthrough has been made in the development and use of world-leading microscopic imaging platforms to test for molecular activities of compounds, including the development of an ultrahigh-speed Total Internal Reflection Structured Illumination Microscope (TIRF SIM).

The first samples have now arrived from China and imaging experiments have started in earnest on the new instrument. Research operations are now in full swing and the programme is advancing as per the 5-year and first year research plans. During the last reporting period, several articles have been published in front line research journals, including PNAS, Nature Communications, Neuron, Journal of the American Chemical Society, Optica, and Biophysical Journal. These cover research on protein misfolding and disease and the development of advanced microscopic platforms for functional and super resolution imaging, both core themes of CIRCE research.

For more information: www.circe.ceb.cam.ac.uk
www.inifinitus-int.com
www.ceb.cam.ac.uk/news/news-list/first-circe-research-meeting

JustMilk Ltd wins National McKinsey Venture Academy

Theresa Maier, PhD Student in BioScience Engineering Group & Cassi Henderson, PhD Student in Analytical Biotechnology Group

Two CEB PhD students and their teammate have won a national social enterprise competition run by McKinsey & Company.



Cassi Henderson (left) and Theresa Maier (right)

CEB PhD students Theresa Maier (BioScience Engineering Group) and Cassi Henderson (Analytical Biotechnology Group) as well as

their teammate Graham Mills (PhD Cancer Research) have recently won the National McKinsey Venture Academy 2016 competition with their start-up JustMilk Limited. The McKinsey Venture Academy is a social enterprise competition for university students based in the UK and Ireland that focuses on the potential social impact of the enterprise. The competition consisted of four stages including the submission of an executive summary, a video pitch, a full business plan as well as a pitching and Q&A session with a panel of judges at the McKinsey London office. Participants in stage 3 were, also, invited to attend a business plan and public speaking workshop by McKinsey at the Institute of Directors in London. The first prize includes seed funding of £10 000 from McKinsey to help transform their idea into a viable social enterprise.

Cassi Henderson commented; *"It has been such a privilege to participate in the McKinsey Venture Academy and through it further define JustMilk's value proposition. It not only gave us the opportunity to engage with like-minded entrepreneurs on a national level but also enabled us to connect with an inspiring panel of judges, characterised by their extensive experience in social entrepreneurship."*

JustMilk Ltd was founded in late 2015, based around technology developed in the Bioscience Engineering Group of the Department. Currently, the company operates with Theresa as CEO while Cassi and Graham are in Business Development. The JustMilk novel drug and nutrient delivery device has the potential to improve the safety, efficacy and access to life-saving medications, vitamins and nutrients to breastfeeding infants globally. JustMilk Limited is the UK entity of the JustMilk project, a unique partnership with a non-profit US entity that aims to reach those in need in both the developed and developing world.

Since its foundation, JustMilk Limited has received

numerous awards and honours. In March 2016, JustMilk Limited (as part of the JustMilk project) won the royal start-up competition Pitch@Palace, set up by the Duke of York and was recognised as a Duke of York Entrepreneur of the Week. Moreover, JustMilk Limited was nominated as a Business Weekly 2016 Start-up of the Year Finalist and listed in the biannual index "Disrupt 100". Each Disrupt 100 venture was sourced from over one million global start-ups and corporate ventures and was scored against a specific criteria measuring the potential it has to affect an existing market or geography, introduce new customers into an existing market and/or creating a new market with significant customer demand. JustMilk Limited's most recent achievement is an invitation to the Hello Tomorrow Summit in Paris in October 2016. They were ranked as one the top 500 start-ups of the "Hello Tomorrow Challenge" out of over 3500 applications globally.

Industry Overview

Well-attended Marie Curie (MSCA) Fellowship Awareness events took place at CEB last term. Participants were offered help with making applications and reassured about the immediate impact of BREXIT.

Impact

Horizon 2020/MSCA



CEB hosted two workshops on Horizon 2020 and Marie Curie Fellowships in June. Over 50 people, including guests from other departments and universities, attended the first workshop, aimed at early stage researchers. Those in

attendance were given advice by Renata Schaeffer (Research Operations Office) and Graham Dransfield (KTF for CEB) on how to meet the demanding criteria required to make a successful application. At the second (post-referendum) workshop, academics were reassured that UK institutions remain fully eligible to apply to all funding schemes of Horizon 2020, as per the statement on BREXIT¹, made by Professor Sir Leszek Borysiewicz, Vice chancellor of the University of Cambridge.

¹www.cam.ac.uk/notices/news/statement-from-the-vice-chancellor-of-the-university-of-cambridge-on-the-result-of-the-eu-referendum

Medals & Awards

IChemE Davidson Medal Launched



'The Davidson Medal' was recently introduced by The Institution of Chemical Engineers (IChemE) in honour of Emeritus Professor John Davidson. The medal will be awarded to individuals in academia or industry who demonstrate

outstanding mentorship to young chemical engineers and opens for nominations in August 2016. The idea of Davidson Medal was put forward by Professor M M Sharma to IChemE council. Professor Sharma said; "John is a life-long friend and respected peer in Chemical Engineering, so I am delighted to see the Davidson medal introduced to IChemE's portfolio. It has been an honour to sponsor the production of the award, and I hope to see some outstanding nominations following its inauguration." Professor Davidson said: "I am delighted and truly honoured to see the introduction of a Davidson Medal, and I am particularly pleased that it recognises mentors in our industry."

More information on Davidson Medal can be found on www.ceb.cam.ac.uk/news/news-list & the application procedure is described on www.icheme.org/about_us/medals/davidsonmedal

Appointments & Academic Promotions

Geoff Moggridge promoted to Professor



Dr Moggridge, leading PI of Structured Materials Group, was promoted to a personal Professorship in Easter Term 2016. Head of Department, Professor John Dennis, congratulated him and said,

"This is a well-deserved promotion. The fact that there were only five promotions to Professor in CUED (Cambridge University Engineering Department) and CEB combined is a great testament not only to Geoff's research insights and profile, but also to his commitment to teaching and to his contribution to the Department." The promotion was published in the University Reporter on 8 June 2016 and will come into effect on 1 October 2016¹.

¹www.admin.cam.ac.uk/reporter/2015-16/weekly/6429/section7.shtm#heading2-22

Professor Wilson appointed Editor-in-Chief of FBP



Professor Ian Wilson was appointed as the Editor-in-Chief (Food) of the IChemE journal, *Food and Bioproducts Processing* (FBP) back in July. He has now taken over from Ken Morison (University of Canterbury, NZ) covering the food side.

He commented; "My role is probably split into three core areas. One of these key activities is to support the Editors in their role, as we work together to ensure that the journal continues to publish high quality and timely work. The second element is more strategic, and I will be reviewing topic areas and thinking about where we should take the journal as it continues to grow. The third part is vetting papers, this is related to ensuring the journal is of the highest quality – FBP only considers a small fraction of papers submitted."

More information on www.ceb.cam.ac.uk/news/news-list/diw-editor-fbp-jul16

Thesis & Poster Prizes

Danckwerts Pergamon Prize for Chris Boyce

The Danckwerts-Pergamon Prize is awarded by the Department each year for the best PhD dissertation on a subject connected with Chemical Engineering. Chris Boyce was a PhD student working with Professor John Dennis and received the



Danckwerts-Pergamon this year for his thesis titled "Fundamental Studies of the Physics of Gas-Solid Fluidization." He said "I am very grateful to receive the Danckwerts-Pergamon Prize for my PhD thesis. It is truly an honour to receive an award named after such a tremendous chemical engineer and human being. My thesis presented findings related to the fundamental hydrodynamics underlying fluidized beds, chemical reactors in which upward flowing fluid suspends particles, such that the particles behave like a liquid. During my PhD, I had an amazing time as part of the CEB community, as a member of the Combustion Group and the Magnetic Resonance Research Centre. I also was an active member in the Gates Cambridge Scholarship community and played football for Trinity College. I feel extremely blessed to have been a part of these great communities as well as to have received excellent guidance in my research from my advisors, John Dennis, Stuart Scott and Daniel Holland."

Achievements

MBE Best Dissertation & Distinctions

CEB's Master's in Bioscience Enterprise (MBE) programme is a multidisciplinary biotechnology and business degree course providing students with the skills in enterprise, management and entrepreneurship essential to work with biotechnology companies or life sciences consultancy sector in addition to the training in the latest advances in exploitable biotechnology. Students have to submit a dissertation of 10,000 words based on research conducted during a company internship in addition to the rigorous modules. Nicholas Ostime bagged the Prize for "MBE Best Dissertation" this year, while three other students, Ian Dardani, Aurelie Deleforge and Harriet Shaw, gained a distinction. Congratulations to all.



Nicholas Ostime



Ian Dardani



Aurelie Deleforge



Harriet Shaw

1st, 2nd & 3rd Year Posters



Professor John Dennis (centre) with (from left to right) David Cox, Geertje van Rees, Tamsin Bell, Michael Sargent, Rittick Barua, Henry Lin

The Graduate Student Conference took place on 18-19 April 2016. Head of Department Professor John Dennis presented the prizes to the winners at a gathering on 3 June 2016. 3rd Year PhD students gave presentations and the three prize winners for the best papers were Michael Sargent, Henry Lin and David Cox. 2nd Year PhD students presented posters. The three prize winners for best posters were Tamsin Bell, Geertje van Rees and Rittick Barua. Geertje, the prize winner, said "Receiving the poster prize was amazing. It is great knowing your work is being acknowledged by others, for which I am very grateful."

Conference Prizes to Yehia Amar & Florian Ströhl's



Yehia Amar, PhD student from Sustainable Reaction Engineering Group, received Best Poster Prize at APACT 2016 (Advances in Process Analytics and Control Technology) that took place

20-22 April 2016 in Chester (UK). He said "My PhD study involves the development of a design of experiments methodology for discovery and optimisation of complex chemical reactions. Going forward we plan to develop a validated theoretical and predictive model for enantioselective catalysis. This would represent a novel alternative to classic trial-and-error discovery approaches in pharma today. I am very grateful to have been awarded this prize. This recognition gives me a great boost of confidence in my abilities going forward."

Florian Ströhl, PhD student from Laser Analytics Group, was awarded the Best Poster Prize for his work on the single molecule translation imaging at The British Biophysical Society Meeting held 6-8 July 2016 at the University of Liverpool. His work is in collaboration with researchers from the Department of Physiology, Development and Neuroscience.



Fellowships

Leete Award to Chris Valentine

The Engineers Trust's Leete award¹ is crafted from the donation of Dr David Leete, a Liveryman of the Worshipful Company of Engineers. The award is given to the best UK student undertaking research in the field of Production Engineering, encompassing all aspects of Manufacturing Research. The Leete Award (starting from October 2016) has been offered to Chris Valentine for his project proposal related to economical production of sensors. Feedback on Chris' project stated "The proposal described a credible fusing of established technologies as the starting point of the manufacture of much improved low cost sensors-on-a-chip for gases, with prospects of advancing the products and their manufacture during the project."

¹www.engineerstrust.org.uk/index.php/award

Summer at the Wilkes



Don't fence me in! Jim Wilkes, pictured left in his home, has just built this fence but managed to escape before putting it in the woods to surround his second compost heap.

Jim Wilkes (Emmanuel College student 1953-1955, ChemEng faculty 1956-1960) has been living in Ann Arbor, Michigan for the past 56 years and has almost succeeded in establishing an English garden, but finds delphiniums and lupins are tricky because of the severe heat and cold in Ann Arbor.

Professor Wilkes was a Demonstrator (Assistant Professor) in Chemical Engineering in Cambridge from 1957 to 1960. Jim is a great friend and supporter of the Department and a regular visitor. He recently gave an illustrated talk on the early days of Chemical Engineering in Cambridge. He last visited us to attend John Davidson's Symposium and 90th birthday celebrations back in March. He came back to visit us at the start of term.

Jim told us about his green-fingered attempts; *"I've spent lots of time in our gardens (two shady and one sunny) and I am at last very happy with them - all is under control. We have two compost heaps going, and I've just made another fence for one of them, and here it is. (It will probably also appear in our Christmas card.) Don't worry, I will get out of it before we hide it in the woods."*

Memories of Margaret Sansom 'First PA to ChemEng HoD'

Former Faculty Professor Jim Wilkes

Margaret Sansom was the first person I encountered when I went to the Chemical Engineering Department at Tennis Court Road in 1953, for an interview with the legendary Professor Fox, to see if Chemical Engineering was a good subject for me, and indeed it was! As secretary and principal assistant, PA to the Professor, Margaret was businesslike, energetic, and full of good humour. A few years later, when I was on the Faculty from 1956-1960, Margaret became a close friend and often came to dinner with me and my wife, Mary Ann, when we lived at Madingley Hall. I would take her to Madingley on our Lambretta scooter, and then to catch the evening bus back home to Huntingdon, where she lived with her father.



Margaret Sansom stroking the Wilkes' family cat when she stayed at their house in Ann Harbour, Michigan, 1984-1985.

Department Events

CEB Career Talk Series 2016 - 2017



This year's lunchtime series will be the first to take place in the new department building in West Cambridge, Lecture Theatre 3, 1 pm.

We'd like to thank all of them for their support and encourage others wishing to get involved in this or other similar initiatives in the near future to please contact Elena Gonzalez on eg314@cam.ac.uk

We welcome your suggestions and feedback on how to best support the Department and its student cohort.

See below the talks alumni and industry partners will be contributing to the Series this academic year. More information on www.ceb.cam.ac.uk/alumni/events/talks

Michaelmas Term:

- **Friday 18 November 2016:** Piran Mahazeri, MA, CEng, FICHEM, Head of Capital Projects Department, Sasol Exploration & Production, "The golden Age of the Oil and Gas Industry is here to stay".

Lent Term:

- **Friday 27 January 2017:** Dr Max Ryadnov, PRS at National Physical Laboratory, "Metrology – a small Pool with wide Reach"
- **Friday 24 February 2017:** Dr Stephen Capsaskis, Senior Business Executive at 7L Capital Partners: Venture Capital and Private Equity.

Easter Term:

- **Friday 12 May 2017:** Dr Malcolm Wilkinson, Kirkstall Ltd Managing Director, "Start-up Companies can be bad for your Health but good for Animals!"

CEB Career Panel, Tuesday 8 November 2016

Department of Chemical Engineering and Biotechnology, Philippa Fawcett Drive, CB3 0AS
Lecture Theatre 1, 1-3 pm

Get thorough insights into your future career options!

The annual Careers Panel event returns to CEB once again. Experts from relevant industry sectors will take part in a career panel exercise to share their experiences with our students and advise on career-related matters of interest.

Students will have a chance to find out more about the varied career options available to them, which can help them make better informed decisions when faced with pressing questions regarding a specific career path to take.

The panel will consist of a selected group of industry representatives from disciplines chosen based on student feedback, with CUCES Careers Rep Ray Fan as Panel Moderator.

Industry reps will be at hand to provide great insights into what's really like to work in different industry sectors and share the highlighting moments of their careers. Among those companies which have previously taken part in the Career Panel are Johnson Matthey, BP, GSK, Jacobs, Exxonmobil, Arthur D Little, Natixis SA and Schlumberger. Industry reps will also tell students about graduate schemes and summer internship opportunities available in their companies and give students tips on job applications.

There will be a Q&A session for undergrads to ask more specific questions about career choices in relevant Chemical Engineering and Biotech fields available to them and well as networking opportunities and a chance to make valuable connections in industry.



New Gates Scholars

Gates is a global scholarship available at Cambridge University for intellectually outstanding postgraduate students with a capacity for leadership and a commitment to improving the lives of others. The following students were successful candidates to receive this distinguished award and will be joining CEB this October. For more information about GATES scholarship visit www.gatescambridge.org



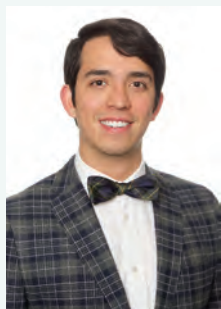
Eric Bringley (PhD in Chemical Engineering)

I was raised in Columbia, South Carolina in the United States and completed my Bachelors of Science in Engineering at the University of South Carolina reading Chemical Engineering with extended coursework in Chemistry and Mathematics. I

came to CEB to work with Professor Markus Kraft to tackle problems through the use of stochastic modelling and hope to work on numerical model development to contribute to the improvement of these tools.

Outside of the lab, the diverse set of peers through the college system and the GATES community was a major factor in the decision to attend Cambridge. Through the generous funding of the Gates Foundation, my journey to lifelong learning and improving the lives of others starts by the exposure and connections made across multiple fields and cultural backgrounds during my postgraduate education.

My opportunity to study at Cambridge will provide me with tools and experience in modelling to solve a broad variety of problems both in and out of chemical engineering. I hope to impact the lives of others through my discoveries as well as acting as a good leader and role model, possibly through a teaching appointment.



Pedro Vallejo Ramirez (PhD in Biotechnology)

I was born in Colombia but raised in Panama, and I have a B.S. in Optical Engineering from the University of Rochester in New York. I will work with Professor Clemens Kaminski on the study and improvement of super resolution microscopy techniques

(SIM, STED) to investigate amyloid plaque formation in brain tissue. Beyond the valuable financial support, the Gates scholarship provides a wide window to connect with extraordinary and promising minds in the sciences, arts, and humanities. I am most excited to meet scholars in fields different from mine, such as anthropology, linguistics, cognitive sciences, history, data science, and so many others that can help me broaden my worldview and create new and exciting tendrils and paths in my thought process.

In my research, I will use my training in optics and lens design to explore new trade-offs in optical and digital complexity for super resolution imaging systems that could improve diagnosis for neurodegenerative diseases such as Parkinson's and Alzheimer's. In the long term, I hope to develop better diagnostic devices for increased health care accessibility in third world regions. In the Cambridge community, I plan on participating actively in scientific outreach, yoga, capoeira, and soccer.



Daniel Charytonowicz (MPhil in Bioscience Enterprise, MBE)

It is a great honour to have been selected to receive the Gates Cambridge Scholarship, and to be joining an ever-growing network of Gates Scholars, each committed to

addressing some of the world's most pressing challenges. I am excited to meet students in the Gates community as well as my department, growing both socially and intellectually during my time at Cambridge. Born and raised in New York, I graduated from the University of Delaware with a Bachelors in Biomedical Engineering. During my time at Delaware, I was involved in research as well as entrepreneurial activities.

I have a passion for applied biomedical research, and translating science into solutions to problems affecting people in the real world. As an aspiring entrepreneur and medical professional, I want to better understand the complexities underlying new ventures within the healthcare field, with a special focus in medical diagnostics. I am looking forward to learning from the diverse experiences of the MBE faculty as well as my classmates, and getting involved within the university community. Following my time at Cambridge, I hope to apply this knowledge toward my future career as a physician scientist, working to expand medical knowledge while simultaneously bringing novel innovations into healthcare practice.

What Brexit? Not in CEB



International make-up of CEB population

Back on 23 June 2016, a referendum took place in the United Kingdom that resulted in a majority vote (52%) for the UK to leave the European Union (EU). This has become known as "Brexit".

Head of Department, Professor John Dennis, took the opportunity to reassure students and staff that there is no immediate change to the University's teaching, research and other activities.

He commented; *"We will continue to work as normal. The lifeblood of CEB is its people and we strongly welcome the very best staff, students and researchers from around the world to become part of its mission. We are committed to promoting equality and diversity. Currently, we recognise that there is a great deal of uncertainty around the referendum result calling for the UK to leave the European Union. However, this will not affect our inclusive approach and proactive international outlook to make CEB an attractive place for the very best global talent."*

Dame Julia Goodfellow, President of Universities UK, commented on the outcome of the EU Referendum; *"we hope to continue to be global in our outlook, internationally networked and an attractive destination for talented people from across Europe."*

CEB has around 200 postgraduate students from 51 different countries and our lecturers come from 10 different countries.

University Vice-Chancellor, Sir Leszek Borysiewicz previously expressed disappointment at the UK's decision to leave the EU. However, he also confirmed that *"the University will continue to work with European partners to understand the implications of Brexit for the University"*. In a separate email to students and staff, he admitted that Brexit is likely to be of concern to many and that the university will *"maintain strong dialogue with the government"*.

More information on www.ceb.cam.ac.uk/news/news-list/brexit

Hardcore Science: From Bacteriology to Lasers and Neuroscience



Amberley Stephens, Mount Fuji, Japan

I've been a researcher in CEB for 2 years now, working in the Laser Analytics (LAG) and Molecular Neuroscience Groups (MNG). I'll be here for another two years as a researcher and lab manager for the Laser Analytics group (LAG), Molecular Neuroscience group (MNG) and Cambridge Infinitus Research Centre (CIRCE). I wasn't always sure whether I wanted to be a scientist. Like many 17/18 year olds, I struggled to choose a University course. On the one hand I enjoyed English literature and history, but on the other hand I also enjoyed biology and chemistry. I came to the conclusion that I can always read and write in my spare time, but I probably wouldn't be wielding a Bunsen burner in the same way, so I ended up at Southampton University studying Biomedical Sciences, a course mostly filled with failed medics. In my third year I took a module in biofilms and microbial communities and I found the world of bacteria and their ability to rapidly adapt fascinating. I applied for a Master of Research (MRes) at the Imperial College London in Microbial Pathogenesis and had a hard-core year of bench science. During my MRes I learned for the first time what real science is like; that hardly any project yields successful or expected results, no matter how many times you perform a Western blot. However, I wasn't put off by the lack of results and continued my academic career with a PhD at Nottingham University. I studied the gut pathogen *Helicobacter pylori* which was made prominent by Barry Marshall and Robin Warren who famously drank a culture of *H. pylori* that resulted in gastritis, this was subsequently treated with antibiotics. I studied a Type IV secretion system, which acts like needles to puncture human cells and inject bacterial proteins or DNA, which often leads to disruption of cell pathways. Although I learned a lot scientifically and about

myself, my PhD was fairly fruitless, so I decided to change subjects to determine whether I had fallen out of love with science or whether it was perhaps just the PhD topic. As I live with my boyfriend in Peterborough, my two closest options for science were therefore London and Cambridge. I chose to apply to the LAG/MNG group as they wanted someone with my DNA cloning skills and to purify proteins for research into the cellular mechanisms leading to Alzheimers and Parkinsons diseases. I am pleased to say that I still do enjoy science, I thrive on learning new things. A few years ago I did not even know what a super resolution microscope was, yet alone operate one which is pretty cool. I enjoy being faced with a problem and fixing or finding an answer for it, and also having the freedom to investigate different ideas, for which I am in a great research group to facilitate this.

I enjoy running, skiing, cooking and eating good food. I've just got the travelling bug having got back from an amazing trip around Singapore and Japan at the beginning of the year. If anyone loves fresh powder they should definitely consider skiing in Niseko in Japan, I've never seen snow like it. We're now planning a trip to India so if there are any recommendations of 'must see' places, please let me know!

Regarding women in science, I have been lucky to have many strong female role models during all of my research. I'm obviously in support of women in STEM subjects (science, technology, engineering and mathematics), but I believe in promoting the best person for the job, not looking at statistics for how many women fill positions. We should be supporting each other and promoting PEOPLE in science and engineering because together we do some amazing research.

Amanda Taylor on Pregnancy



Graduate Secretary Amanda Taylor posing with her bump

If you have recently passed me on the stairs, you may have noticed that I go a bit more slowly and take up a fair amount of space, as I'm growing my own chemical reactor. ☺ The prospect of becoming a mother has made me both greatly excited and perhaps a little scared. Nonetheless, I look forward to becoming a mom - joys, challenges and all.

I am really having a great time getting to know this little person who kicks me from the inside at regular intervals, especially when I am settling down to sleep. This little one is very active according to every midwife she or he has 'met' and thus gives me the appetite of a whole rugby team. I have not really had so much by way of cravings unless it is food in general. I'm really, really hungry!

I am still trying to get in as much exercise as I possibly can—hence the huffing and puffing up the Department's stairs, walks around the city center that remarkably go right past doughnut shops and Starbucks and looking at my FitBit numerous times each day to see how I am doing. I am also finding that putting on socks rather nicely combines yoga and cardio; it is getting harder and harder to reach my feet!

Ben and I are really looking forward to becoming parents. We have had a lot of great adventures during our 20 years of marriage and we are looking forward to this next one! I am excited about my year of maternity leave and getting to know this new, little person. We do not know if it is a boy or a girl, which is quite exciting! As our baby is due around Christmas time, finding out will be a great Christmas present.

New Human Resources Adviser

Emma Frampton

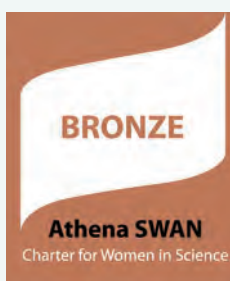


I joined the Department as Human Resources (HR) Adviser on 9 May 2016. Before joining the Department, I was working as HR Business Partner at Durham University where, in various roles in the central HR team, I provided

general HR advice and support to departments within each of the academic faculties. After living and working in Newcastle and Gateshead for over 20 years, I decided it was time for a change and to look for an opportunity to live closer to my family in East Anglia, which led to my move to Cambridge.

My role in CEB is to provide advice and support on a range of HR-related issues, for example, probation, progression, appraisals, training and development, recruitment, employee relations' issues and communication. I work closely with Cara Bootman, HR Administrator, who is responsible for the day-to-day HR duties in the Department. I am also involved in progressing actions and initiatives relating to the Staff Survey, the Athena SWAN action plan and the move to the new building. I am a member of the Senior Management Board and I provide support for the Staff Committee and Athena SWAN Working Group.

CEB scoops Athena SWAN Bronze



CEB has recently been bestowed the Athena SWAN Bronze Award. The charter was established to encourage and recognise commitment to advancing careers of women in all subjects. CEB staff and student gender balance is agreeable in comparison with key national

benchmarks. The percentage of female staff currently working at CEB stands at 34%.

The award will be presented at a ceremony on Monday 12 December at the University of Liverpool.

The award will be covered extensively in the Lent issue. For now, more can be found at www.ceb.cam.ac.uk/news/news-list/athena-swan-bronze-award

This is Cambridge: Newton's Apple Tree at Trinity College



Newton's tree at the end of winter with crocuses just beginning to flower underneath

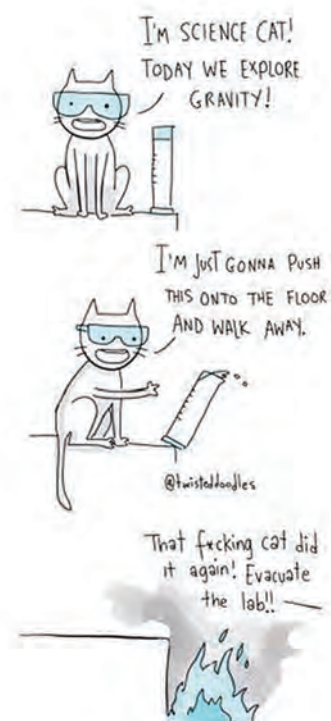
'On a warm evening in 1666, just after dinner, the soon to be famous Issac Newton sat down beneath this tree outside of Trinity to mull over his thoughts, when all of a sudden he was struck on the top of his head by a large, red apple. 'Eureka', he cried, and Gravity was discovered.'

As entertaining as this tale is, Newton was not struck on the head by an apple and he was not underneath this tree. In fact, no such tree existed in Cambridge at the time, but in just half a century, this grand myth was woven by his admirers from its original simple story. This tree was grafted in 1954 from the original one at the home of Sir Isaac Newton's mother in Woolsthorpe, Lincolnshire, and it was on a visit to his mother's garden during his Cambridge days in the late 1660s, he observed a green apple fall from a tree, and only then began to consider the mechanism that drove what is now termed Gravity. Furthermore, the trees are Flower of Kent, which produces green cooking apples, not red eating apples.

So why did this myth evolve? In an interview with the Independent, Royal Society head archivist, Keith Moore explained: "The story was certainly true, but let's say it got better with the telling. The story of the apple fitted with the idea of an Earth-shaped object being attracted to the Earth. It also had a resonance with the Biblical account of the tree of knowledge, and Newton was known to have extreme religious views".

From philosophy to physics, from fairy-tale to fact, Newton's apple tree remains a strong part of Trinity's heritage.

Comics



CEB Teaching Consortium of Companies



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

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